FARMERS' STRATEGIES AND IMPROVED RUBBER AGROFORESTRY SYSTEMS

Support mission report n° 3
Indonesia

Support mission to SRAS/CFC project/ICRAF
from 18th to 29th April 2007 in Indonesia

Eric Penot, CIRAD-TERA,

August 2007.

FARMERS'STRATEGIES AND IMPROVED RUBBER AGROFORESTRY SYSTEMS

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Key persons encountered during the mission

Gede Wibawa Project Manager and Head Research Bureau, IRIEC
Laxman Joshi Project Manager
All SRAS Staff In Bogor and ambi/Kalimantan

Report content

List os species cited in in the document

Fruit trees

- mangoustan *(Garcinia dulcis)*
- anones (*rollinia spp*),
- *citrus spp*
- banane (musa spp)
- "Salak" : *sallaca spp*
- "durian" : *Durio zibethinus*
- "longkong" : *Lansium domesticum* (or Aglia duku, griff)
- "petai" : *Parkia speciosa* (Nita tree)
- "jack fruit" : *Artocarpus heterophyllus*
- "cempedak" : *Artocarpus Integer*

Timber species

- Tembesu *Fagraea fragrans*
- Meranti Batu : *Shorea leprosula*
- neem tree ou "thiem"/tung : *Azadirachta excelsa*, (Jack) Jacobs
- "Thang" : *Litsea grandis*
- Teak : *Tectonia Grandis*
- mahogany : *Switenia macrophylla*
- "phayom" : our white meranti : *Shorea talura*
- "tumsao" : *Fragacs fragans* :
- Seleng : *Livistana speciosa* Kurz

Fast growing trees

- *Gmelina arborea,*
- *Paraserianthes falcataria,*
- *Acacia mangium,*
- *Acacia crassicarpa,*
- *Gliricidia sepium*

Miscellanous trees observed in RAS systems (Thailand)

- rotin : *(Calamus caesius)*
- Nual *Garcinia merguensis Wight*
- Tung Fa *Alstonia macrophylla* Wall.
- Kee Tai *Ilex cymosa Bl*
- Ma Had *Artocarpus lakoocha* Roxb.
- Tung *Litsea grandis Hook. f.*
- Moa *Eugenia grandis Wight*
- Taw *Cratoxylum maingayi Dyer*
- Kor Hang *Rinorea lanceolata Ktze.*
- Mai Hun *Knema laurina Warb.*
- Sae *Millettia atropurpurea Benth*
- khempa *Pavetta wallichiana Steud*
- Kradook Kai Kao *Justicia gendarussa Linn*
- Kee Rad : *Streblus ilicifolius Corner*
- Mhui *Micromelum minutum* Wight & Arn.

1 Introduction

Two preliminary technical support missions have been implemented in February 2005 and May 2006, undertaken by E. Penot and JM Eschbach, from CIRAD.

The purpose of this last mission (April 2007) is the following:

- Validation of scenarios hypothesis and discussions with farmers' groups in Kalimantan
- analysis of the technical/economic siimulation and modelling implemented with the software "Olympe" developed by INRA, CIRAD and IAMM (E. Penot).
- Proposal for further analysis of the farming system reference monitoring network.

The mission was composed of Gede Wibawa (Indonesia), Laxman Joshi (Thailande), Eric Penot and Jean Marie Eschbach with the participation of ICRAF staff in Bogor.

Rapid historic of SRAP/SRAS

The first phase of the Smallholder Rubber Agroforestry Project (SRAP) took place from September 1994 to June 1998. The project was implemented jointly by CIRAD and ICRAF with the collaboration of GAPKINDO; IRRI/Sembawa and IRD. Funding was provided by USAID, ICRAF, GAPKINDO and CIRAD.
The SRAP/SRAS set out to:

- Develop improved rubber agroforestry technical pathways through on-farm trials taking a participatory approach with local farmers in 3 provinces. Development of such technologies and their integration within local farming systems with a future further a development perspective was based on
- a dual sustainability objective:
economic sustainability, through diversification of incomes and physical sustainability through reintegration of some of the biodiversity of forest or agroforest origin, maintenance of a forest type environment with all its advantages in terms of soil fertility, water management, erosion control, and rehabilitation of degraded land of the *Imperata* grasslands type, etc.).
- Monitor issues concerning farmers' adoption of innovations and farmers'strategies on technical change

The second phase of SRAP occurred from 1998 to 2004 with D Boutin (CIRAD-CP) as team leader. The third phase began with the launch of the project on "Improving the productivity of rubber smallholdings through Rubber Agroforestry Systems", funded by the CFC, called SRAS.

2 the Farming system Reference monitoring network (FSRMN)

Farming systems monitoring with FSRMN

The objective of a farming system monitoring is to monitor and follow-up technical change and adoption of innovations by farmers: both farmers involved in the experimentation process and others who can copy the technology and change it as well.

The global methodology used in SRAP/SRAS is based on the following points that create a framework for implementation:

- ***Diagnosis***

---> a preliminary diagnosis based on the study of all available information (bibliography, data collection, key-persons) and an exploratory survey.
Implemented in 1994-1995 and later in 2002-2004 for new areas.

- ***A farming system characterisation survey*** *:*

---> to understand constraints, opportunities, income and labour productivity of each cropping systems and farm activities. The data analysis should provide an operational typology.
Implemented in 1996 (Pasaman), 1997 (Kalimantan and Sumatra) with farming system trajectories analysis in 2000 and farming system modelling in 2001, 2003 and 2005.

- ***On-farm experimentation programme identification***

---> the identification of a potential on-farm experimentation programme aimed to solve technical constraints (technical innovations) or social constraints (organisational innovations). On Farm trials protocoles should be identified according to typology. A prioritisation of experiments should be made.

- ***Implementation of On-farm experimentation***

---> Implementation of on-farm identification using participatory approach in a on-farm trials network**.**
Experiments of SRAP have been implemented in1995-96 and nex trails of SRAS in 2002 and 2004-2005.

- ***Farming systems monitoring***

---> implementation of a “farming systems monitoring network of reference” in order to monitor technical change, adoption of innovations and assess its impact as well as its externalities at the farming systems level and at a regional level as well.

To be implemented in 2006 after farming system modelling in 2005.

- **Analysis and re-assessment of the research programme**

---> Feedback analysis with farmers, extension and research institutions and re assessment of the on-farm trial in an constant and evolutive process of R-D

Permanent implementation and analysis every year.

Another objective is to assess the impact of experimentation and technology adoption as well as its externalities at farming systems level and at a regional level as well. Adopting a specific innovation or changing from one cropping pattern to another one can have positive or negative externalities. It is therefore important to record them.
Such monitoring is implemented in a “farming systems monitoring network” composed of “farms of reference”. A certain number of farms are selected, according to the typology and monitored. It is logically a continuation of data valorisation of the

first farming systems survey, initiated in 1997, then continuated in 2001 and 2005 with French students (see list of papers in annex).

The farming system survey is aimed to characterise farming systems. The farming systems monitoring network aimed to record technical change and its impact on farms' resources and management. WINSTAT can be used to store and process data. Olympe can be used to model farming systems and test impact of new technologies or cropping systems as well as for prospective and risks analysis. (a list of papers on Olympe or using Olympe is in annex).

The tool Olympe is now well known by the team members and in particular by Wulan who is the "farming system modelling with Olympe" officer at ICRAF. She made a tremendous work and effort in mastering the software that constitute a real "plus" for ICRAF and the project.

Analysis and re-assessment of the research programme

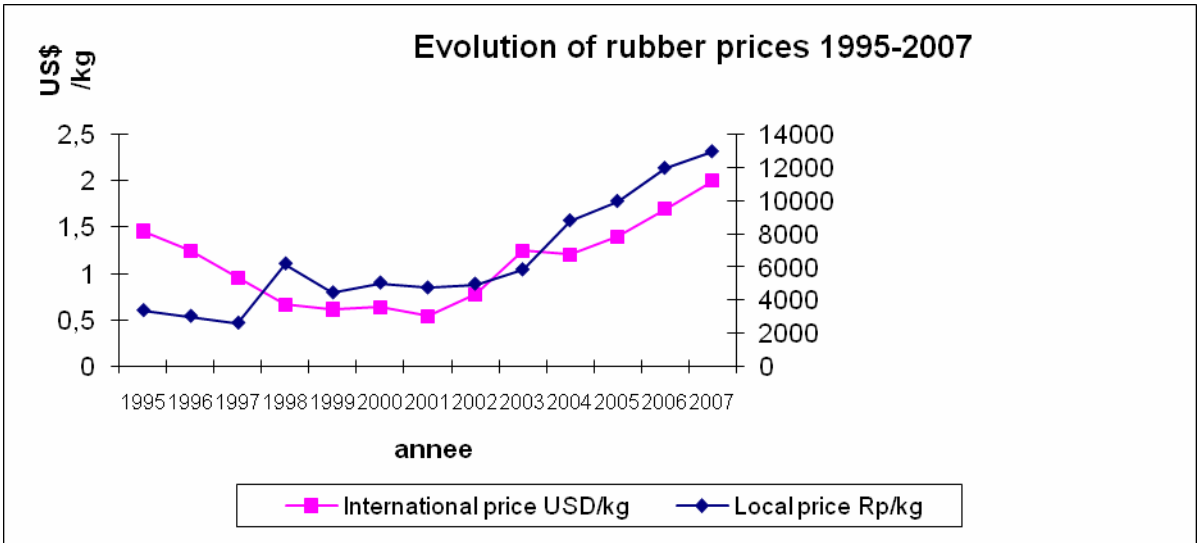
A constant feedback is necessary to assess if the R&D activities are still aimed to its original objectives and to see if its impact is relevant. Analysis with farmers, extension and research institutions and a re-assessment of on-farm trials efficiency as well as farming system monitoring in an constant and evolution process of R-D. A final analysis through the production of a RAS manual, communications and papers.

The situation in Kalimantan has been well documented with working papers, communications papers and thesis from students and from team members. The situation in Jambi has been recently surveyed and a report is already available.

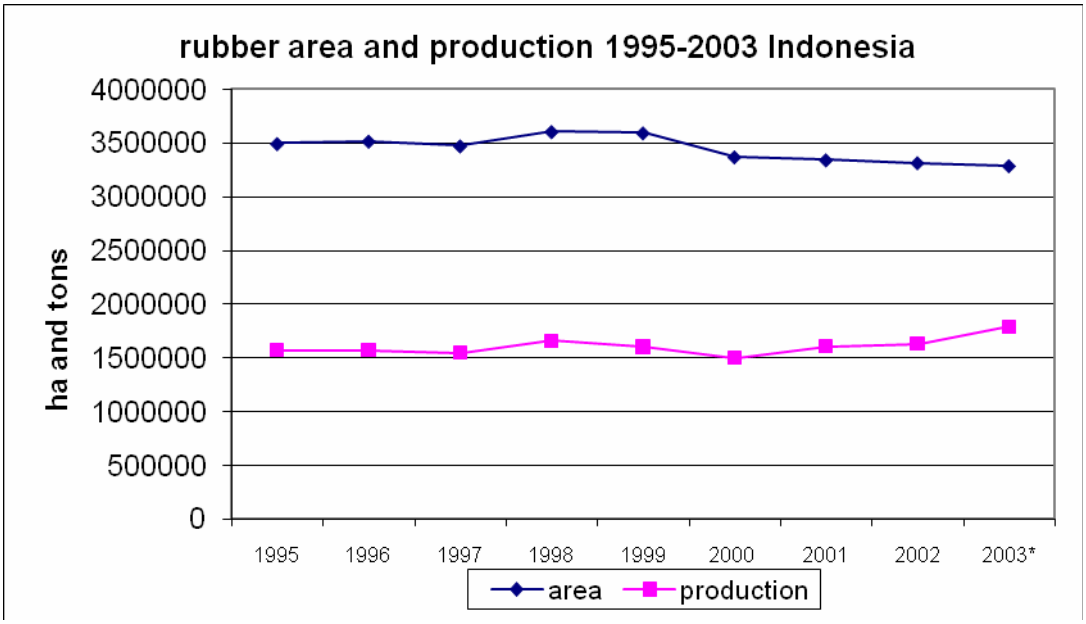
Impact of rubber prices

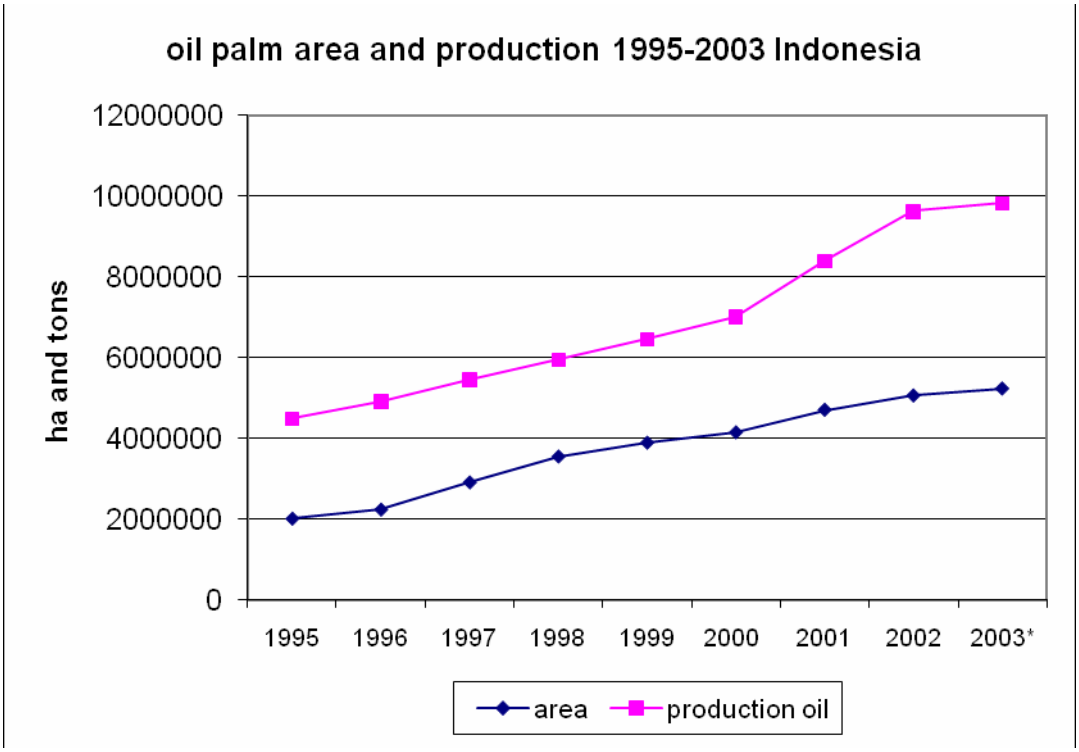
The impact of the current rubber prices is very significative with an important windfall effect since 2006 (see the rubber prices evolution since 1995.

Rubber price evolution : international price (NY in US $/kg DRC 100) abd local price , Kalimantan, in Rp/kilo (price drc 100 for non smoked rubber sheet quality, the most common in kamimantan).



The rubber production is slightly increasing in Indonesia as rubber area seems to decrease according to official figures (at least up to 2003, DGE) meantime oil palm area and production (both estates and smallholders) are still skyrocketing.





Oil palm was considered as the main alternative during the rubber crisis years (1997-2002) and effectively was the most effective alternative in term of income generation both for return to labour and net margin/ha. Most farmers of our project area have acquired a “kapling”, set of 2 ha of oil palm plantation with a private company

scheme. But since rubber price have recovered, the trend has reversed and rubber is now mostly favoured compared to oil palm, in particular first for higher income generation and secondly because rubber does not imply loss of land as it is the case with oil palm companies.

Local rubber prices have sky rocketed when rupiah remains stable since 2002 (see following table for local rubber price).

Price of Rubber in West Kalimantan (70% DRC)

(Rp)

Month	2000	2001	2002	2003	2004	2005	2006	2007
January	2 800	2 900	3 000	3 700	5 000	6 500	9000	11 000
February	2 800	2 900	3 000	3 700	5 000	6 500	9000	11 000
March	2 800	2 900	3 000	3 700	5 000	6 000	10000	11 000
April	2 800	2 900	3 000	3 800	5 100	6 000	10000	12 000
May	2 800	2 900	3 000	3 800	5 000	6 600	10000	
June	2 800	2 900	3 200	3 500	5 000	6 700	10000	
July	2 800	2 900	3 200	3 500	4 800	7 000	10000	
August	2 800	3 000	3 200	3 500	5 200	7 400	10000	
September	2 800	3 000	3 200	3 500	5 500	7 500	10000	
October	2 800	3 000	3 200	5 000	5 600	8 000	10000	
November	2 800	3 000	3 200	4 700	6 200	8 300	11000	
December	2 800	3 000	3 200	4 900	6 200	9 000	11000	

Price at Bodok, Parindu, Sanggau
Recorded by Ilahang, ICRAF

These high rubber prices have as well boosted rubber replanting (of old jungle rubber considered as “land reserve”) and new planting. Most replanting are monoculture and only 20 % of farmers do replant with agroforestry practices as shown in the point 3 of this report for the Kalimantan situation according to our survey in April 2007.

Among the 80 % farmers that replant in monoculture, some of them (20 to 30 %) have the intention to enrich their rubber plantation with timber trees after the third or fourth year. Such strategy has been already observed since several years, in the 2000’s, in particular in the village of Embaong for instance. In this village , due to land scarcity, most old unproductive jungle rubber have been recently replanted with PB 260 in monoculture , eventually enriched with timber species. In that case, the strategy is mainly to integrate the ageing old SRDP clonal plantations (GT 1 planted in the 1980’s) which yield began to seriously decrease and replace them. Unfortunately, the very poor tapping quality (see Eschbach’s 2007 report) seriously harmed the future of these new plantations. It seems that the real lifespan of new plantations will be around 15 to 20 years rather than the traditional 30-30 years with clones. May be such situations will create a new and more rapid turn-over of plantations.

In 1995, at the beginning of the SRAP project, farmers' strategy was mostly oriented on fruit trees. But since fruit commodity systems are not currently sufficiently developed (as it is the case in Thailand for instance), fruit production cannot be valorized properly. Farmers' interest moves to timber production after regulation on timber have changed and allow timber production by smallholders. Therefore, timber enrichment is now the main trend on term of agroforestry practices. Local projects with partial approach favour rubber and Gaharu (an interesting tree that produce a resin of a very high value and quality). Most farmers are not interested in that proposal due to the low number of rubber trees/ha in this system. Farmers do prefer to plant 550 rubber trees /ha, whatever type of plantation and planting density with enrichment of Gaharu (up to 275 trees /ha at 6 x 6 metres for instance. In other words, rubber remain the main economic component of any agroforestry system. Timber species most favoured are : tengkawang, Nyatoh merah, meranti and durian.

Concerning agroforestry practices during immature period, we observe that most farmers are currently not any more as interested as in the previous years in agroforestry practices in particular due to the very cheap price of herbicide (Roundup or equivalent) that decrease seriously interest in capital saving practices. In other words : when rubber price is high as well as income, farmers do prefer to use cheap but efficient input such as herbicide to maintain young planting rather than labour saving agroforestry practices. Herbicide with current low price and easy use is more competitive than agroforestry practices when farmers can afford it, which is globally the case when rubber price is above 1 US $/kilo. Cheap round up with high rubber income decrease interest in RAS 1 technology except for poor or isolated farmers.

Planting material for clonal rubber is comparatively cheaper in 2007 than in the 1990's or beginning of the 2000's. Most farmers prefers to buy clonal planting material rather than producing it except for poor or isolated farmers for which the budwood programme approach remains effective.

One main very recent feature is the use of credit at Kredit union at the rate of 2 %/ month which is quite high. Most credit contracts have been used for housing, purchase of motorbikes or children education. No credit has been used for funding new plantations or any agricultural activities. New planting have been funded almost exclusively from oil palm and rubber income

Last, upland rice planting decreases as return to labour for rice is far too low compared to that of rubber. Most farmers do buy their rice for family consumption rather producing it as it was the case in the 1990's.

3 The situation in Kalimantan

A survey of 1 week before the mission has been implemented. Main results are presented in annex 5.

We tried to assess for all SRAP farmers in the original 6 villages (sine 1995) what have been the rubber planting on their own without any external help (survey implemented in April 2007). The following tables show that almost all farmers began

to plant after the economic crisis ended, and when oil plan income became significant. This therefore confirms the global hypothesis that new clonal rubber plantation, whatever type (monoculture or Agroforestry systems) have been funded mainly by oil palm incomes and boosted since 2004 by better rubber prices. First replanting occurred in 1997, in 2000 (village of Sanjan) and most between 2003 and 2007.

The distribution is the following

Planting	%
No planting	12
< 0.5 ha	25
0.5 to 1 ha	26
>1 ha	35
Seedling	12

Knowing the fact that most families had between 2 and 4 ha of ageing jungle rubber, 1 ha of clonal rubber and 2 ha of oil palm, farmers strategy has been first to develop clonal rubber from old jungle rubber if they has no access to project in the 1980's or replace ageing project SRDP clonal plantation. Due to limited family labour and no external available labour, most smallholders are limited to 2 ha of clonal rubber, 2 ha of oil palm and 2/3 ha of jungle rubber.

The extreme diversity observed in tapping frequencies indicates that there is no general strategy on tapping but at the opposite as much strategies as farmers. It seems therefore very difficult to analyse accurately the real constraints behind a replanting trend relatively limited.

We can observe the following reasons :

- high frequency tapping limit available family labour and therefore the maximum rubber cropped area
- The very harsh conditions during the period of the indonesian economic crisis deter smallholders to invest un rubber when oil palm war considered as the real alternative.
- Most replanting occurs in the last 3-4 years confirming that good rubber prices were the real incentive for replanting

It is remarquable that farmers still plant unselected rubber in Trimulia (6 out of 10 for an average area of 0.57 ha), after so many years of information and strong extension on clonal rubber.

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New rubber planting for SRAP farmers

Village	Farmer	Clonal rubber trees	first planting	Type1	new planted area	Clonal rubber trees	second planting	Type2	new planted area
Kopar	Yohanes	200	2005	Mono	0,36	60	2006	RAS 2	0,11
Kopar	Akut	70		Mono	0,13				0,00
Kopar	Kolanus	200	2003	Mono	0,36				0,00
Kopar	Abui	700	2006	Mono	1,27				0,00
Kopar	Sudin	300	2004	RAS 1	0,55				0,00
Kopar	Kai	160	2006	Mono	0,29				0,00
Kopar	Kimbon	700	2000	SAF	1,27				0,00
Kopar	Muksin	200	2003	Mono	0,36				0,00
Kopar	Indi				0,00				0,00
Engkayu	Gabriel	220	2000	RAS 1	0,40	350	2004	RAS 1	0,64
Engkayu	Six	300	2006	Mono	0,55				0,00
Engkayu	Joni	550	2007	Mono	1,00				0,00
Engkayu	Andreas	200	2006	Mono	0,36	200	2007	Mono	0,36
Engkayu	Angkong				0,00				0,00
Engkayu	Basan	180	2005	Mono	0,33				0,00
Engkayu	Apan	250	2006	Mono	0,45				0,00
Engkayu	Fransisco Surip	360	2006	Mono	0,65	1000	2007	Mono	1,82
Engkayu	Noh	800	2005	Mono	1,45				0,00
Engkayu	Otol	70		Mono	0,13				0,00
Engkayu	LC Lahong	270	2006	Mono	0,49				0,00
Engkayu	Gamin	120	2006	Mono	0,22	200	2007		0,36
Engkayu	Fransiscus	350	2006	Mono	0,64				0,00
Embaong	Lidi	300	2000	Mono	0,55	100	2003		0,18
Embaong	Cacot	300	2007	Mono	0,55				0,00
Embaong	Loheng	350	2006	Mono	0,64	350	2007		0,64
Embaong	Sami	700	2000	Mono	1,27	450	2003		0,82
Embaong	Tonil	320	2003	Mono	0,58	400	2007		0,73
Embaong	Doncu	500	2000	Mono	0,91	600	2006		1,09
Embaong	Sidon	1000	2005	Mono	1,82	500	2007		0,91
Embaong	Alysius	500	2007	Mono	0,91				0,00
Embaong	Laten	250	2006	Mono	0,45				0,00
Trimulya	Sarjoko	150	1997	Mono	0,27				0,00
Trimulya	Ponimin	400	2006	Mono	0,73				0,00
Trimulya	Sadianto	275	1998	Mono	0,50				0,00
Trimulya	Yasdi				0,00				0,00
Trimulya	Sardi	700	2006	Mono	1,27				0,00
Trimulya	Margono	60	1997	Mono	0,11	100	2006		0,18
Trimulya	Suwito	150	1997	Mono	0,27				0,00
Trimulya	Sriadi	275	2007	Mono	0,50				0,00
Trimulya	Priyo Harjono				0,00				0,00
Trimulya	Raji Mulyono				0,00				0,00
Trimulya	Marjo Wiyoto				0,00				0,00
Sanjan	Rupinus	300	2005	RAS	0,55	550	2000		1,00
Sanjan	Abit	500	2000	RAS	0,91				0,00
Sanjan	Udin	500	2000	RAS	0,91				0,00
Sanjan	Ignasius	500	2000	RAS	0,91				0,00
Sanjan	Sudin	500	2000	RAS	0,91	300	2005		0,55
Sanjan	Kiong	350	2007	RAS	0,64	800	2007		1,45
average		359			0,57	397			0,23

Village	Farmer	Clonal rubber trees	third planting	Type3	new planted area	local rubber planting	Year	Type	new planted area
Kopar	Yohanes				0,00				0,00
Kopar	Akut				0,00				0,00
Kopar	Kolanus				0,00				0,00
Kopar	Abui				0,00				0,00
Kopar	Sudin				0,00				0,00
Kopar	Kai				0,00				0,00
Kopar	Kimbon				0,00				0,00
Kopar	Muksin				0,00				0,00
Kopar	Indi				0,00				0,00
Engkayu	Gabriel				0,00				0,00
Engkayu	Six				0,00				0,00
Engkayu	Joni				0,00				0,00
Engkayu	Andreas				0,00				0,00
Engkayu	Angkong				0,00				0,00
Engkayu	Basan				0,00				0,00
Engkayu	Apan				0,00				0,00
Engkayu	Fransisco Surip				0,00				0,00
Engkayu	Noh				0,00				0,00
Engkayu	Otol				0,00				0,00
Engkayu	LC Lahong				0,00				0,00
Engkayu	Gamin				0,00				0,00
Engkayu	Fransiscus				0,00				0,00
Embaong	Lidi	700	2007		1,27				0,00
Embaong	Cacot				0,00				0,00
Embaong	Loheng				0,00				0,00
Embaong	Sami	1800	2005		3,27				0,00
Embaong	Tonil				0,00				0,00
Embaong	Doncu	500	2007		0,91				0,00
Embaong	Sidon				0,00				0,00
Embaong	Alysius				0,00				0,00
Embaong	Laten				0,00				0,00
Trimulya	Sarjoko				0,00	300	2006		0,55
Trimulya	Ponimin				0,00	400	1997		0,73
Trimulya	Sadianto				0,00				0,00
Trimulya	Yasdi				0,00	200	2006		0,36
Trimulya	Sardi				0,00				0,00
Trimulya	Margono				0,00				0,00
Trimulya	Suwito				0,00	350	2006		0,64
Trimulya	Sriadi				0,00	400	2006		0,73
Trimulya	Priyo Harjono				0,00				0,00
Trimulya	Raji Mulyono				0,00				0,00
Trimulya	Marjo Wiyoto				0,00				0,00
Sanjan	Rupinus				0,00				0,00
Sanjan	Abit				0,00	150	2007		0,27
Sanjan	Udin				0,00				0,00
Sanjan	Ignasius				0,00				0,00
Sanjan	Sudin				0,00				0,00
Sanjan	Kiong				0,00				0,00
average		1000			1,82	300			0,55

Upland and lowland rice planting area, oil palm area

Village	Farmer	Ladang Upland rice	Sawah lowland rice	Oil palm Ha	Nb of zebus
Kopar	Yohanes	0	0,4		
Kopar	Akut	1	0,2		
Kopar	Kolanus	0,5	0,3		
Kopar	Abui	0,5			
Kopar	Sudin				
Kopar	Kai	0,5			
Kopar	Kimbon	0,5			
Kopar	Muksin				
Kopar	Indi	0,3	0,5		
Engkayu	Gabriel		0,25	2	
Engkayu	Six			2	
Engkayu	Joni				
Engkayu	Andreas	0,5			
Engkayu	Angkong	0,5		3	
Engkayu	Basan	1		1	
Engkayu	Apan	1		1	
Engkayu	Fransisco Surip	1		1	
Engkayu	Noh	1		1	
Engkayu	Otol			3	
Engkayu	LC Lahong	0,25		1	
Engkayu	Gamin	0,25		1	
Engkayu	Fransiscus				
Embaong	Lidi				
Embaong	Cacot				
Embaong	Loheng				
Embaong	Sami				
Embaong	Tonil				
Embaong	Doncu				
Embaong	Sidon				
Embaong	Alysius				
Embaong	Laten				
Trimulya	Sarjoko		0,25	1	
Trimulya	Ponimin		0,5		
Trimulya	Sadianto		1	0,75	2
Trimulya	Yasdi		0,5	0,75	2
Trimulya	Sardi		0,5	0,75	2
Trimulya	Margono			1,75	
Trimulya	Suwito		0,25		
Trimulya	Sriadi		0,25	0,75	
Trimulya	Priyo Harjono		0,25	0,75	
Trimulya	Raji Mulyono		0,25	0,75	
Trimulya	Marjo Wiyoto		0,25	0,75	3
Sanjan	Rupinus	0,5	0,5		
Sanjan	Abit	0,25			
Sanjan	Udin		0,5		
Sanjan	Ignasius	0,5			
Sanjan	Sudin		0,5		
Sanjan	Kiong	1	0,25		
average		0,58	0,39	1,26	2,25

Village	Farmer	Credit amount	Use 1	Use 2
Kopar	Yohanes	8 000 000	motorbike	
Kopar	Akut	8 000 000	motorbike	housing
Kopar	Kolanus	15 000 000	motorbike	housing
Kopar	Abui	8 500 000	motorbike	
Kopar	Sudin	8 000 000	housing	
Kopar	Kai	10 000 000	housing	
Kopar	Kimbon	15 000 000	housing	
Kopar	Muksin	9 000 000	housing	motorbike
Kopar	Indi	13 000 000	housing	motorbike
Engkayu	Gabriel	yes	schooling	
Engkayu	Six	no		
Engkayu	Joni	yes	schooling	fertilizers
Engkayu	Andreas	no	schooling	
Engkayu	Angkong	yes	schooling	
Engkayu	Basan	yes	schooling	
Engkayu	Apan	yes	housing	
Engkayu	Fransisco Surip	yes	motorbike	
Engkayu	Noh	no		
Engkayu	Otol	yes	saving	
Engkayu	LC Lahong	yes	housing	
Engkayu	Gamin	yes	housing	
Engkayu	Fransiscus	yes	motorbike	
Embaong	Lidi	yes	misce…	
Embaong	Cacot	yes	misce…	
Embaong	Loheng	yes	misce…	
Embaong	Sami	yes	misce…	
Embaong	Tonil	yes	misce…	
Embaong	Doncu	yes	misce…	
Embaong	Sidon	yes	misce…	
Embaong	Alysius	yes	misce…	
Embaong	Laten	yes	misce…	
Trimulya	Sarjoko	yes	misce…	
Trimulya	Ponimin	yes	misce…	
Trimulya	Sadianto	yes	misce…	
Trimulya	Yasdi	yes	misce…	
Trimulya	Sardi	yes	misce…	
Trimulya	Margono	yes	misce…	
Trimulya	Suwito	yes	misce…	
Trimulya	Sriadi	yes	misce…	
Trimulya	Priyo Harjono	yes	misce…	
Trimulya	Raji Mulyono	yes	misce…	
Trimulya	Marjo Wiyoto	yes	misce…	
Sanjan	Rupinus	yes	misce…	
Sanjan	Abit	yes	misce…	
Sanjan	Udin	yes	misce…	
Sanjan	Ignasius	yes	misce…	
Sanjan	Sudin	yes	misce…	
Sanjan	Kiong	Yes	misce…	

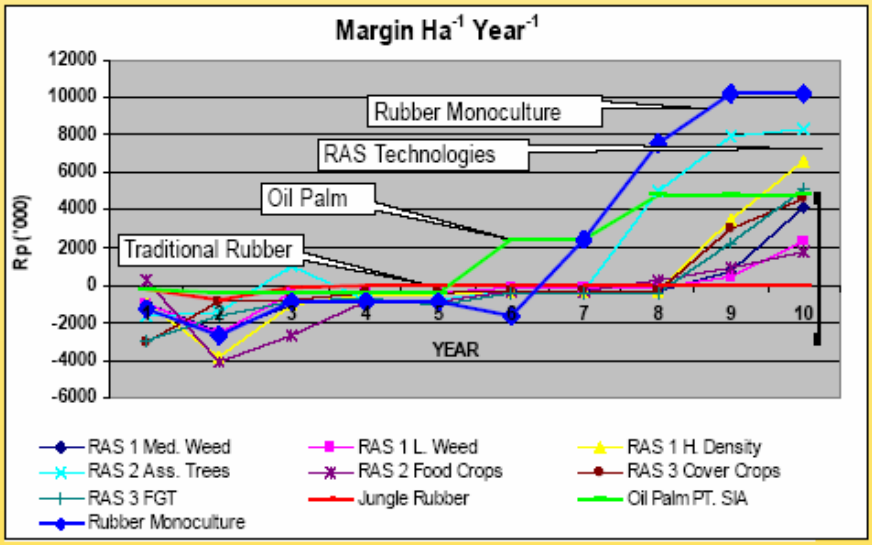
The 2 last tables displays the real rice cropped area which is now lower than 10 or 15 years ago with averagely either upland rice, ladang (0,58 ha/year) or lowland rice (sawah/bawas ith 0.39 ha/year). Farmers abandon progressively rice for more rubber or oil palm with a gar better margin/ha and return to labour.
This trend was already observed at the end of the 1990's when clonal rubber became the main alternative, lately with oil palm.

The second table shows that almost all farmers took credit for family purposes or livelihood improvement. Such situation could jeopardize farmers situation if rubber price decrease within the next 2 or 3 years as most farmers have taken a credit on a 4 years basis.

Wulan and the author have reviewed carefully the data set to be sure that there is no mistake. Further analysis can be done now in particular in assessing new potential scenario according to price fluctuations of rubber and oil palm

Preliminary interesting results were presented through a poster (source , **Yuliana Cahya Wulan, Suseno Budidarsono, Laxman Josh).**:

In the first ten years, RAS technologies shows much higher margin compared to traditional systems but lower than that of monoculture systems. RAS technologies require lower capital and inputs.



Profitability of Rubber Agroforestry Systems

Coupling the Olympe with Net Present Value (NPV) measurement to see 'discount factor' consequence of long investment.

FARMING SYSTEMS	NPV (Rp'000/ha)	YPC (years)	EST. COST (Rp'000/ha)	Return to Labor (Rp /Ps-days)
Jungle Rubber	(1,073)	-	13,629	17,907
RAS 1 Low mgmt	10,087	13	10,874	40,838
RAS 1 Medium mgmt	11,197	14	14,318	47,629
RAS 1 High density	13,496	12	12,657	47,629
RAS 2 Food crops	4,116	18	21,834	25,113
RAS 2 Ass. trees	18,316	10	15,373	42,749
RAS 3 Cover crops	2,864	13	19,427	23,189
RAS 3 FGT	7,127	14	18,513	27,683
Rubber monoculture	18,567	10	19,035	35,683
Monoculture SRDP	8,045	14	20,192	29,477

Note: 1 US$=9000 IDR

Synthetic table have been prepared for the West Kalimantan case studies :

Definition o production phase with Olympe

Production phases

SPECIES	Begin_Depr	Maxi	1	2	3	4	5	6	7	8	9	10
Jungle rubber	15	40	1	2	3	10	15	26	30	40		
Monoclonal rubber	7	30	1	2	4	5	7	8	15	20	25	30
SRAP	7	25	1	2	3	4	7	8	15	20	25	
Oil Palm	3	25	1	2	3	5	8	11	19	25		
Tembawang	10	100	1	2	3	10	20	40	80	100		
RAS Sendiri	7	25	1	2	3	4	7	8	15	20	25	

Note : each phase in Olympe in made of 1 or several "homogenous years".

Synthetic results

Farming System	Cycle	Yield*	Labour Needs	Before-1	
				Margin	Margin per hour
	(year)	(ha^{-1} yr^{-1})	(hours)	('000 IDR)	('000 IDR)
Sawah (Local variety of paddy)	1	1256	1345	1730	1,29
Ladang (Upland Paddy)	1	397	1216	1543	1,27
Jungle Rubber	40	662,65	40900	-30	-0,04
Monoclonal SRDP	30	1416,67	37717	0	0
Monoclonal Independent	30	1246,8	37717	-40	-0,04
RAS Poor Tapping Management	25	1023,36	21508	-40	-0,04
RAS Good Tapping Management	25	1176,16	21508	-40	-0,04
RAS Trimulya Poor	25	1499,24	16594	-40	-0,04
RAS Trimulya Good	25	1653,24	16594	-40	-0,04
RAS Sendiri	25	21508	16594	-40	-0,04
Oil Palm PT.SIA	25	9640	12954	0	0
Oil Palm PT.Indofood	25	12080	12954	0	0

Farming System	Phase -1		Phase-2		Phase -3	
	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)
Sawah (Local variety of paddy)						
Ladang (Upland Paddy)						
Jungle Rubber	2163	3,18	150	1,56	0	0
Monoclonal SRDP	347	0,82	-1350	-11,35	-600	-5,04
Monoclonal Independent	-587	-1,39	-329	-2,77	-329	-2,77
RAS Poor Tapping Management	-1330	-2,25	-366	-3,26	-338	-5,37
RAS Good Tapping Management	-1330	-2,25	-366	-3,26	-338	-5,37
RAS Trimulya Poor	-1330	-2,25	-366	-3,26	-338	-5,37
RAS Trimulya Good	-1330	-2,25	-366	-3,26	-338	-5,37
RAS Sendiri	-1196	-2,02	-600	-5,36	-600	-9,53
Oil Palm PT.SIA	0	0	0	0	909	2,13
Oil Palm PT.Indofood	0	0	0	0	1119	2,63

Farming System	Phase-4		Phase -5		Phase-6	
	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)
Sawah (Local variety of paddy)						
Ladang (Upland Paddy)						
Jungle Rubber	5904	4,44	9184	7,29	7380	5,86
Monoclonal SRDP	0	0	7380	12,55	14760	17,57
Monoclonal Independent	-329	-3,08	12612	21,45	16876	20,09
RAS Poor Tapping Management	-113	-3,22	9463	8,67	13407	12,28
RAS Good Tapping Management	-113	-3,22	12612	11,55	16876	15,45
RAS Trimulya Poor	-113	-3,22	14194	17,33	21607	26,38
RAS Trimulya Good	-113	-3,22	14194	17,33	21607	26,38
RAS Sendiri	0	0	14194	13	21607	19,79
Oil Palm PT.SIA	2273	3,87	4547	7,73	6820	11,6
Oil Palm PT.Indofood	1958	3,33	3635	6,18	5034	8,56

Farming System	Phase -7		Phase-8		Phase -9	
	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)
Sawah (Local variety of paddy)						
Ladang (Upland Paddy)						
Jungle Rubber	5248	4,17	4805	4,58		
Monoclonal SRDP	16400	19,52	19680	23,43	11480	13,67
Monoclonal Independent	13120	15,62	11037	13,14	11037	13,14
RAS Poor Tapping Management	13407	12,28	7888	7,22		
RAS Good Tapping Management	11037	10,11	11037	10,11	5000	
RAS Trimulya Poor	15769	19,25	12612	15,4	5000	
RAS Trimulya Good	18926	23,11	15769	19,25	5000	
RAS Sendiri	15769	14,14	12612	11,55	5000	
Oil Palm PT.SIA	5456	9,28				
Oil Palm PT.Indofood	4195	7,13				

The data reviewed with Wulan should normally permit to review the paper presented at IRRDB 2006 in Laos in order to have more precise data.

4 The situation In Jambi

A report is already available on the work implemented in this province which is very different from West-Kalimantan. It has been summarized in the following pages :

ECONOMIC ANALYSIS OF IMPROVED SMALLHOLDER RUBBER AGROFORESTRY SYSTEMS IN JAMBI, INDONESIA

Site description

Administratively the study site has separated into two districts since 1999 which are Kabupaten Bungo and Kabupaten Tebo. Annual rainfall varies between 2398 mm to 3500 mm (133 -176 rainy days per year). Annual average temperature is 25 ^{o} – 29 ^{o} Celsius.

Table 1 Site characterization

Village	Kuamang Kuning	Muara Buat Rantau Pandan	Sepunggur	Teluk Kuali Pulau Temiang	Muara Kuamang
Population	Javanesse transmigrant (muslim)	Local malay	Local malay	Local malay and spontaneus transmigrant (muslim)	Local malay (muslim)
Topography	Transmigration area Peneplain	Piedmont	Peneplain	Near transmigration area Peneplain	Piedmont zone
Population density	High	Low	High	Medium	Medium
Land availability	Limited land	Plenty	Limited land	Plenty	Limited land
Main farming system	Oil palm and rubber	Jungle rubber and local monoculture Clonal rubber Irrigated rice	Local monoculture Clonal rubber Slash and burn for Upland field	Clonal monoculture Local monoculture	Jungle rubber and local monoculture Oil palm Irrigated rice
Constraint		Pig and monkey as young rubber disease			Low access to improved planting material Lack of clonal rubber technology
Opportunities	Good access on planting material and input for both rubber and oil palm Good access on market for oil palm Good price of rubber	Good access to market for rubber, but planting material provider is limited Good price of rubber wood	Good access to market and planting material for rubber	Improved Planting material and input for rubber was provided through project - nursery Good price of rubber wood	Access to oil palm market is medium
Other commodities				Sengon Gaharu	Other timber
Plantation projects	Oil palm through PT SAL	RAS 1 and RAS 2	RAS 1 and RAS 2	ARP TCSDP	Oil palm through PT Megasawindo
Off farm activity	Oil palm worker Carpenter Trader	Trader Carpenter Mining work	Trader Carpenter Mining	Trader Carpenter	Oil palm worker Carpenter

Source: Elok Mulyoutami, 2005

3 villages have been integrated from the 2 previous one : Seppunggur and Muara Buat/Rantau Padan

Labor required for different rubber systems is presented in Figure 1.

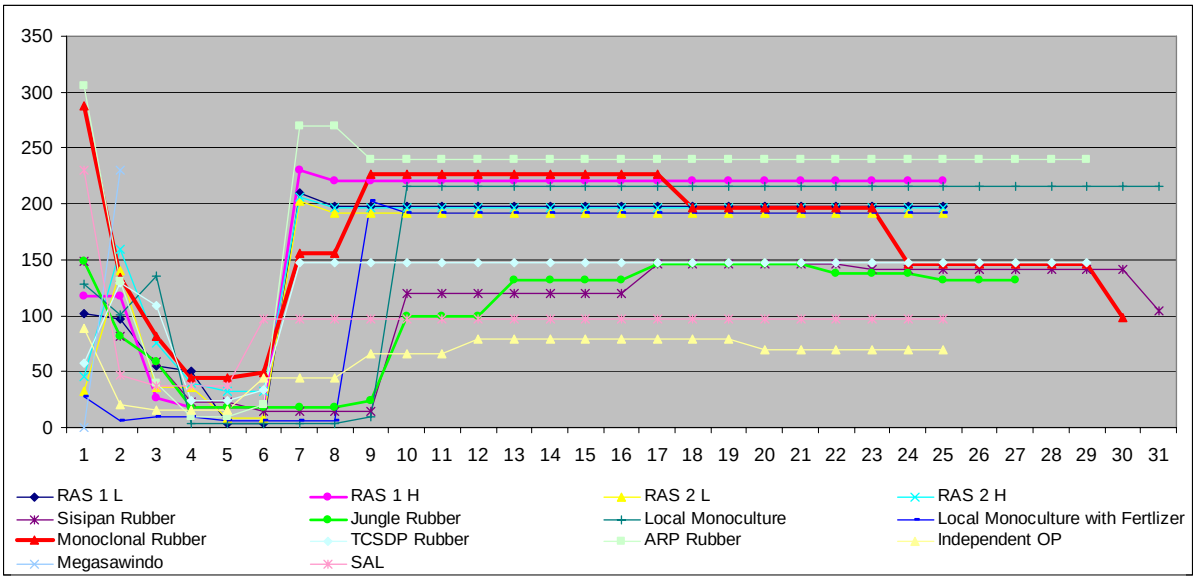


Figure 1. Labor required for various farming system in Jambi

Note :
Labor requirement is one of the most important feature to collect in order to assess return to labour. Fortunately, labor data collection is not too difficult for rubber and oil palm

Rubber productivity

. The Figure 2 shows the estimated latex yield (DRC 50%) of various systems under the study for 40 years.

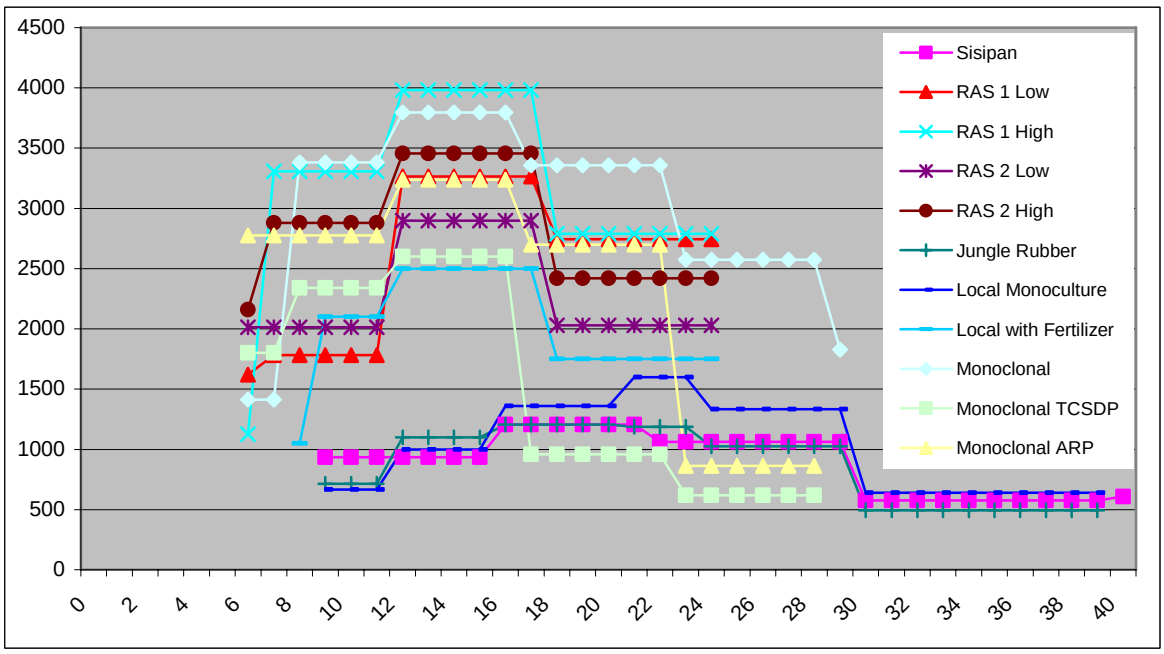


Figure 2 Latex yield of different rubber systems in Jambi

The details average of rubber yield (DRC 100%) of various rubber based farming systems is showed in the Table 4 below.

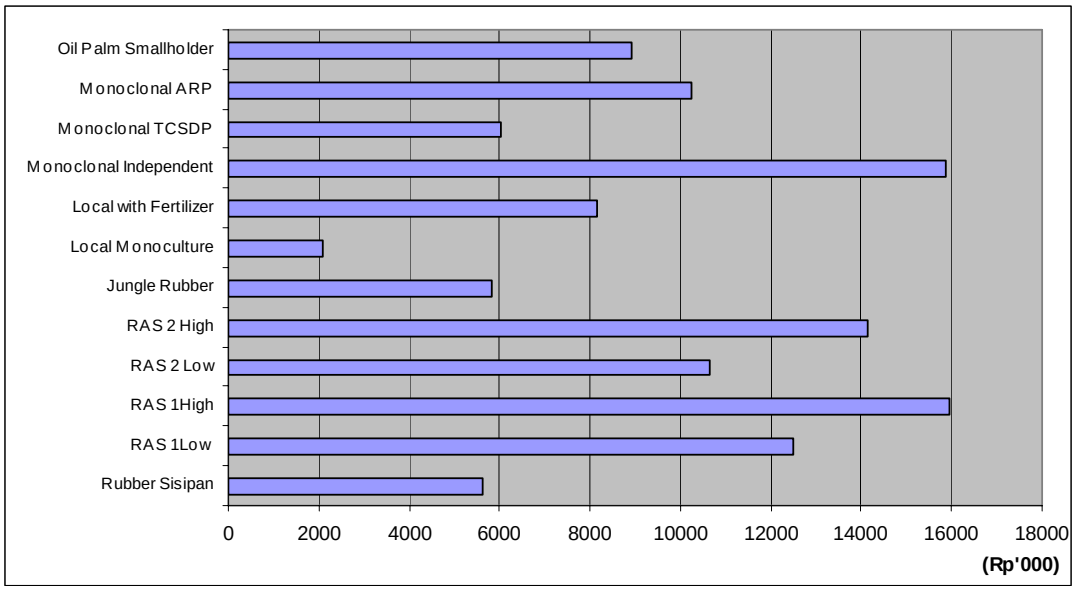
Table 2 Average rubber production from different rubber systems

FARMING SYSTEMS	Average Yield DRC 100% (kg/ha/year)
1. Rubber Sisipan	348
2. Jungle Rubber	439
3. Local Monoculture	516
4. Local Monoculture with Fertilizer	1,018
5. RAS 1 Low Maintenance	1,298
6. RAS 1 High Maintenance	1,607
7. RAS 2 Low Maintenance	1,149
8. RAS 2 High Maintenance	1,427
9. Monoclonal Independent Smallholder	1,516
10. Monoclonal TCSDP	770
11. Monoclonal ARP	1,178

Economic performance of various rubber systems

One of the results of the Olympe measurements are used to assess the margin per ha per year and the margin per person-day. The following graphs show the margin of various rubber based farming systems and the smallholder oil palm in the study sites.

Figure 3. Profit margin per ha per year



The economic assessment for the various rubber based systems in Jambi show the RAS 1 with high maintenance has the highest margin (Rp. 15,970,000 $ha^{-1}year^{-1}$). The value is close to the margin of monoclonal smallholder (Rp. 15,883,000 $ha^{-1}year^{-1}$). While the traditional systems show very low margin (ranging Rp. 2,072,000 - 8,172,000 $ha^{-1}year^{-1}$).

Due to high price of rubber (Rp 9,000 per kg 50% DRC), currently these rubber based systems have high production incentives (margin per person-day), except for local monoculture system (Rp. 15,200 person-day^{-1}) which is lower than the average wage rate in the province (Rp. 30,000 person-day^{-1}).

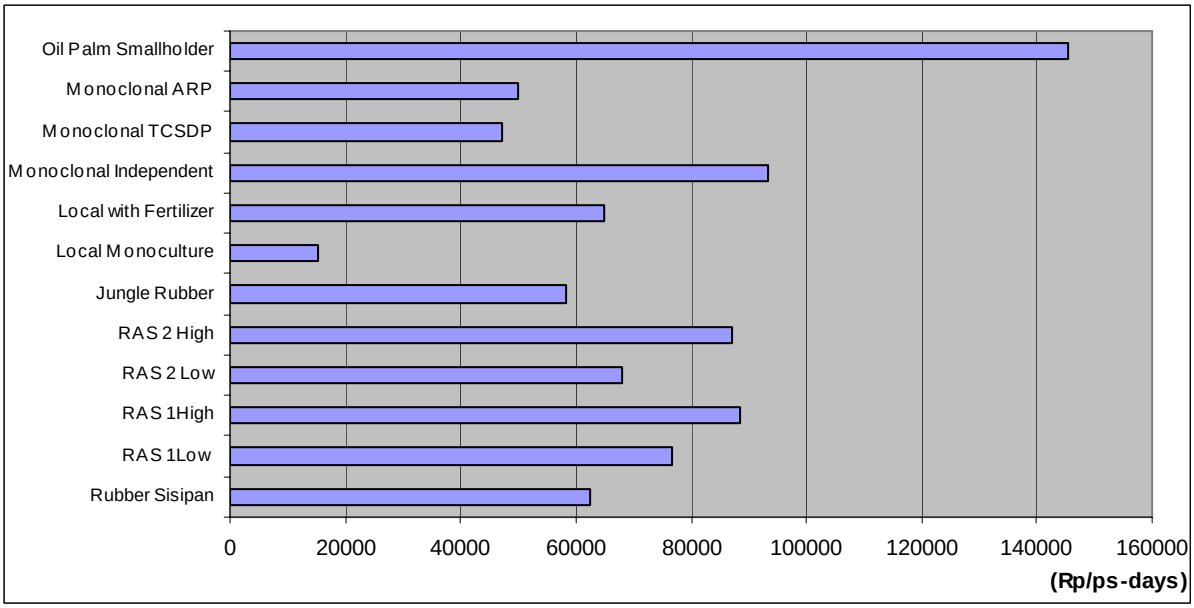


Figure 4. Profit margin per person day

Oil palm is also an attractive land use option for smallholder in Jambi as in many other provinces in Indonesia. Independent smallholder oil palm cultivation, on smaller scale of 2-10 ha appeared in Jambi (Rimbo Bujang and Kuamang Kuning) only in 1995. This followed the success of government promoted PIR Trans (NES) model (Budidarsono, et.all, Draft Manuscript).

The results show the margin per year for smallholder oil palm is Rp. 8,917,000 ha^{-1} and the margin per person-day is Rp. 145,280 ps-day^{-1}.

Scenario prospecting for rubber price fluctuation

The objective of scenarios building is to asses the strengths or resilience of technologies.

The Figure 6 below shows how the effect of price volatility on rubber and fresh fruit bunch of oil palm to the margin value. The simulation was constructed based on price tendency of both commodities. The results indicate that the margin of rubber monoculture system declines the same as margin of RAS system, because of the buffering by diversified products such as fruits and timber.

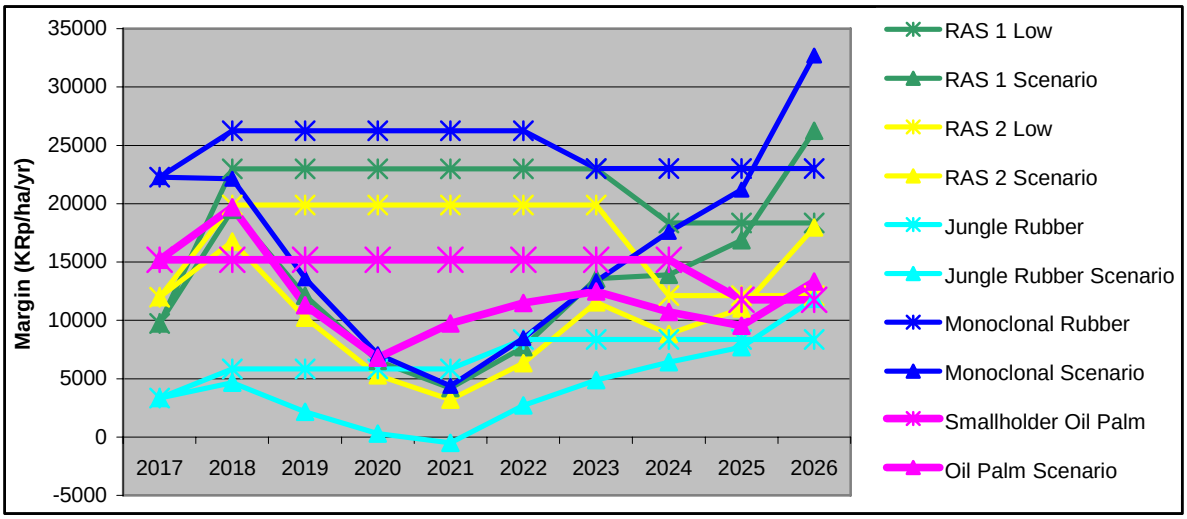


Figure 6. Simulating rubber price and FFB price

Basically farmers considered rubber as a “refuge”, a valuable, flexible and sustainable crop, even when prices are low, as was the case in the period from 1997 to 2002. The importance of diversified systems become obvious at times of low rubber price or other problems.

A synthetic table for economic result has been prepared.

Definition o production phase with Olympe

Production phases

SPECIES	Begin_Depr	Maxi	1	2	3	4	5	6	7	8	9	10
Jungle rubber	15	40	1	2	3	10	15	26	30	40		
Monoclonal rubber	7	30	1	2	4	5	7	8	15	20	25	30
SRAP	7	25	1	2	3	4	7	8	15	20	25	
Oil Palm	3	25	1	2	3	5	8	11	19	25		
Tembawang	10	100	1	2	3	10	20	40	80	100		
RAS Sendiri	7	25	1	2	3	4	7	8	15	20	25	

Note : each phase in Olympe in made of 1 or several "homogenous years".

Synthetic results

Farming System	Cycle	Yield*	Labour Needs	Ps-day	Phase -1	
					Margin	**Margin per hour**
	(year)	(ha^{-1} yr^{-1})	(hours)		('000 IDR)	('000 IDR)
Sawah (Local variety of paddy)	1	741	938	134	1799	1,92
Sawah (Improved variety of paddy)	1	1191	1054	151	2788	2,64
Ladang (Upland Paddy)	1	563	1078	154	1249	1,16
Sisipan Rubber	68	603,71	9200	1 314	-3665	-3,07
Jungle Rubber	45	610,35	32144	4 592	3135	2,63
Local Seedling Monoculture	40	1400	43616	6 231	-765	-0,75
RAS Poor Tapping Management	25	1216	26356	3 765	-312	-0,42
RAS Good Tapping Management	25	13248	26356	3 765	-312	-0,42
ARP Monoclonal	30	10632	31772	4 539	-165	-0,07
TCSDP Monoclonal	30	10632	31772	4 539	-4558	-12,12
Independent Monoclonal	30	1870	32756	4 679	-4229	-1,84
Independent Oil Palm	25	8360	12596	1 799	-1566	-220

Farming System	Phase-2		Phase -3		Phase-4	
	Margin	**Margin per hour**	**Margin**	**Margin per hour**	Margin	Margin per hour
	('000 IDR)	('000 IDR)	('000 IDR)	('000 IDR)	('000 IDR)	('000 IDR)
Sawah (Local variety of paddy)						
Sawah (Improved variety of paddy)						
Ladang (Upland Paddy)						
Sisipan Rubber	650	0,99	-125	-0,26	0	0
Jungle Rubber	850	1,3	-25	-0,05	0	0
Local Seedling Monoculture	735	0,91	750	0,69	0	0
RAS Poor Tapping Management	-1198	-1,54	-247	-0,56	-247	-0,62
RAS Good Tapping Management	-1198	-1,54	-247	-0,56	-247	-0,62
ARP Monoclonal	735	0,07	750	2,23	0	0
TCSDP Monoclonal	-63	-0,05	85	0,08	0	0
Independent Monoclonal	351	0,33	-609	-0,94	-808	-2,29
Independent Oil Palm	-1630	-10,19	-1773	-20,14	-98	-0,23

Farming System	Phase -5		Phase-6		Phase -7	
	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)
Sawah (Local variety of paddy)						
Sawah (Improved variety of paddy)						
Ladang (Upland Paddy)						
Sisipan Rubber	0	0	8359	8,71	12946	11,08
Jungle Rubber	0	0	0	0	8359	7,92
Local Seedling Monoculture	0	0	10728	7,13	17880	11,89
RAS Poor Tapping Management	0	0	14304	11,35	21456	17,03
RAS Good Tapping Management	0	0	14304	11,35	21456	17,03
ARP Monoclonal	0	0	16092	19,16	20920	16,6
TCSDP Monoclonal	-338	-1,24	16092	13,59	20920	17,67
Independent Monoclonal	-802	-2,05	13689	16,3	20881	16,57
Independent Oil Palm	2692	4,99	7342	13,62	8272	15,35

Farming System	Phase-8		Phase -9		Phase-10	
	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)	Margin ('000 IDR)	Margin per hour ('000 IDR)
Sawah (Local variety of paddy)						
Sawah (Improved variety of paddy)						
Ladang (Upland Paddy)						
Sisipan Rubber	13883	12,31	9541	11,47	9902	12,63
Jungle Rubber	12784	10,95	14483	13,12	13626	12,9
Local Seedling Monoculture	21456	14,27	25032	16,64	17880	11,89
RAS Poor Tapping Management	12516	9,93	10728	8,51	20000	
RAS Good Tapping Management	17880	14,19	14304	11,35	20000	
ARP Monoclonal	23244	18,45	8582	6,81	5543	5,5
TCSDP Monoclonal	23244	19,63	8582	7,25	5543	4,68
Independent Monoclonal	26245	20,83	28033	22,25	11570	11,48
Independent Oil Palm	9202	17,07				

6 Conclusion

The Indonesian economic crisis ended up in 2002-2003 and international rubber prices recover at the same time providing a real and significative income improvement since 2003-2004 and even creating a windfall effect in 2006-2007. Such situation created real incentive for investment in rubber after years of oil palm booming. The relatively good current incomes out of rubber (and secondly from oil palm) and real cheap herbicide based maintenance methods are more favourable to monoculture than to agroforestry systems. However, still 25 to 30 % of farmers replant RAS systems or enrich their clonal plantation with timber or Gaharu. Least, agroforestry practices couls be developed only for a limited period in the total life span of rubber according to local opportunities. For instance, many RAS1 plot have been transformed into monoculture when the immature period has been successful with such agroforestry practices. Meanwhile, some farmers reintroduce timber duting the monoculture stage.

If rubber high price is good news for rubber smallholders, it does not imply that it is the same for agroforestry practices.

The current situation does not condemn agroforestry practices but suggest that agroforestry practices depend largely on various types of situation and are still very promising for poor farmers without access to capital or project.

The main constraints for agroforestry practices during immature period is that herbicide is more effective in terms of labour and cheap. The main constraints for agroforestry practices during production period are the lack of real commodity chain for fruits and the long lifespan of timber.

However, timber enrichment in rubber based agroforestry systems seems to be the most promising trend in the next years in particular in a context more favourable for smallholders for timber production as timber is becoming scarce.

The farming system network and farming system modelling enable to analyse all situation, rebuild the past to identify farmers trajectories and explore potential future scenarios according to the current trend. Resilience analysis could also be performed to test smallholders' ability to face commodity prices decreases.

ICRAF is now well tooled and trained for such purpose that can be applied to others type of agroforestry situation.

Annexes

Annexe 1

Improving the Productivity of Rubber Smallholdings through Rubber Agroforestry Systems

Terms of reference of Technical Support Mission from CIRAD to SRAS-CFC project - ICRAF South-east Asia

Schedule: 22-29 April 2007

Objectives of the mission

The objectives of this third and final technical mission are:

- To assess the available data and information from trial and demonstration plots and to analyse and interpret them into research results.
- To review the current state of knowledge of existing trials and demonstration plots in order to develop an exit plan for these plots from the CFC project perspective.
- To review efforts and output of socio-economic and farming systems analysis and develop recommendations on various rubber technologies appropriate for smallholder farmers in the project sites in Indonesia.
- To prepare outline and/or drafts of technical reports of results from on-going rubber trial and demonstration plots in West Kalimantan, Jambi and West Sumatra.
- To develop ideas for a future smallholder rubber development project for Indonesia and other potential countries in Asia and Africa.

The overall scientific collaboration and support to the project by CIRAD continues in line with project objectives and plans. The SRAS-CFC project is coming to an end in the near future; and this mission is geared to summarise the technical aspects of research, demonstration and dissemination activities for smallholder rubber development. Value and implications of current results of these efforts in Indonesia for other Asian and African countries will be discussed and appropriate recommendations developed.

Expected outputs from the technical mission:

- a comprehensive assessment of on-farm trials and demonstrations in West Kalimantan and Jambi established since 1994;
- comprehensive review and analysis of data and information from rubber trials and demonstration in the project sites;
- a thorough analysis of farming systems data from West Kalimantan in order to develop appropriate recommendations for smallholder farmers in Kalimantan and their value and implications to farmers in other regions of Indonesia and elsewhere;
- Ideas on future project/s on smallholder rubber agroforestry in Indonesia and other countries in Asia and Africa.

Two persons have been identified for this mission:

- Dr. Jean-Marie Eschbach, (CIRAD-CP), Agronomist
- Dr. Eric Penot (CIRAD-TERA), Socio-economist

Technical mission period: 6 working days + 2 travelling days

Proposed Itinerary for CIRAD mission to Indonesia

22 April	Montpellier-Paris - Jakarta
23-28 April	Bogor
29 April	Jakarta-Paris-Montpellier

Annex 2

Program in Sanggau (tentative schedule),

17 April 2007 - arrival in Pontianak and directly to Sanggau

18 April 2007
07.30 – 08.30 – traveling from Sanggau to Engkayuk
08.30 – 10.30 – discussion with Farmers in Engkayuk
10.30 – 11.30 – visit the Pak Andreas and Gabriel's plot
11.30 – 12.00 – lunch in Engkayu
12.00 – 13.00 – traveling from Engkayuk to Kopar
13.00 – 15.00 – discussion with Farmers in Kopar
15.00 – 16.00 – visit the Pak Indi and Rasyid's plot
16.00 – 17.30 – back to Sanggau

19 April 2007
07.30 – 08.30 – traveling from Sanggau to Embaong
08.30 – 10.30 – discussion with Farmers in Embaong
10.30 – 11.30 – visit the Pak Cacot, Aloysius and Sidon's plot
11.30 – 12.00 – lunch in Simpang Sanjan
12.00 – 13.00 – traveling from Embaong to Sanjan
13.00 – 15.00 – discussion with Farmers in Sanjan
15.00 – 16.00 – visit the Pak Indi and RAsyid's plot
16.00 – 17.30 – back to Sanggau

20 April 2007
07.30 – 09.00 – traveling from Sanggau to Trimulya
09.30 – 11.00 – discussion with Farmers in Trimulya
11.00 – 12.00 – visit the Pak Margono plot
12.00 – 13.30 – traveling from Trimulya to Sanggau
13.30 – 14.30 – lunch in Sanggau
14.30 - …… discussion in ICRAF office

21 April 2007
07.00 - Sanggau – Pontianak – Jakarta – Bogor.

Anex 3

Bibliographic references on farming system modelling with Olympe

Published

Gede Wibawa, Laxman Joshi, Meine van Noordwijk, Eric Penot (2006). Rubber Agroforestry System (RAS) Technologies: opportunities for optimising smallholder rubber systems. Paper presented for "agroforestry systems", 2006, in press.

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making process in a world of uncertainty. Acta agricultura serbica, vol IX, n° 17,(2004), p 33-50. Cacak, Yougoslavie. Disponible également sur le site Web de IRSA.

In progress

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- Penot E. Methodological use of the Farming System Modelling software « Olympe ». Paper presented at the Workshop in Kpalimé, Togo, 7-13 december 2003. Pour publication dans le Projet de livre « Diversifier ses investissements, épargner, transmettre un patrimoine Application aux cultures pérennes dans le monde tropical. Côte d'Ivoire, Ghana, Cameroun, Nigeria, Indonésie. » . Editeurs scientifiques : Yerfi Fosu (Université du Ghana) & François Ruf (CIRAD).

Book

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Wulan, Y.C., Budidarsono, S., Joshi, Laxman. 2006. Predicting Economic Benefits From Farming Practices Using The Olympe Approach: A Case from Rubber Agroforestry System in West Kalimantan, Indonesia. The poster is prepared for The Conference on "Sustainable Sloping Lands and Watershed Management: Linking Research to Strengthen Upland Policies and Practice". Luang Prabang, December 12 – 15, 2006.

Wulan, Y.C., Budidarsono, S., Joshi, Laxman. 2006. Economic Analysis of Improved Smallholder Rubber Agroforestry Systems in West Kalimantan, Indonesia - Implications for Rubber Development. The paper is prepared for The Conference on "Sustainable Sloping Lands and Watershed Management: Linking Research to Strengthen Upland Policies and Practice". Luang Prabang, December 12 – 15, 2006.

Penot E, Feintrenie L. (2005) Risk assessment, market uncertainties and diversification strategies for rubber farmers: comparison between Indonesia and Cambodia using farming systems modelling. "Farming Systems and Poverty: Making a Difference". 18th Symposium and Global Learning Opportunity. Rome, Italy. 12-16 September 2005, International Farming Systems Association (IFSA), with FAO and IFAD. Publié sur le net.

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Penot E., Feintrenie L. & Simien A (2005). Analyse prospective, construction de scénarios et analyse des stratégies paysannes avec l'outil de modélisation des exploitations agricole Olympe. Farming system modeling with Olympe seminar, Rouen, ESITPA/CIRAD, 2003.

Eric Penot. (2004). Risks assessment through farming system modelling to improve farmers's decision making process in a world of uncertainty. IFSA, 2004, Orlando. Publié sur le net.

Penot E. (2004) Risk assessment through farming systems modeling to improve farmers' decision making processes in a world of uncertainty. Workshop n° 18: "Globalisation and the social transformation of family farming: resistance and mutation". IRSA World congress of International Rural sociology Association. Tronheim, Norway, July 2004.

Penot E., Le Bars M., Deheuvels O., Le Grusse Ph., Attonaty JM (2004). Farming systems modelling in tropical agriculture using the sofware "Olympe". Séminaire ECOMOD, Policy modelling international conférence, Paris , Juin 2004. Edité par Ali Bayar. Disponible sur CD rom et sur le site ecomod.

Penot E, Hébraud C (2003). Modélisation et analyse prospective des exploitations hévéicoles en Indonésie : Utilisation du logiciel Olympe pour la définition de scénarios d'évolution en fonction de choix techniques et des aléas. Séminaire Olympe, CIRAD, Septembre 2003, Montpellier. Publié dans l'ouvrage co édité par Penot E et Deheuvels O « Modélisation des exploitations agricoles avec le logiciel Olympe ». Ouvrage collectif. Accepté par les éditions l'Harmattan, date de publication Janvire 2007.

Penot, E. (2003). Le logiciel « OLYMPE »un outil de simulation et de modélisation du fonctionnement de l'exploitation agricole. Séminaire SHS, CIRAD, Septembre 2003, Montpellier.

Penot E, Hébraud C. & Lecomte J. Modélisation des exploitations agricoles des zones hévéicoles dans les provinces de Kalimantan et Sumatra, Indonésie . , CIRAD-TERA. Farming system modeling with Olympe seminar, Montpellier , CIRAD, 2003.

Annex 4 : powerpoint presentation of the 2007 april survey in Kalimantan

West Kalimantan in 2007 : Agroforestry practices and farmers‘ strategies

Results of the survey in April 2007

Main trends in 5 SRAP villages

Eric Penot

Ilahang

Half of RAS plots established in 1995-1996 are managed in monoculture !

All new planting in 2006-2007 are in monoculture

- So
- What about the future of agroforestry practices ????
- Let s see the contexts and the clients !

2007 a new context

- **MAIN TRENDS**

- 1994 : traditionnal farmers , no capital, high interest in low cost clonal rubber planting and income diversification. Agroforestry practices fits well these conditions.

- 2000 : economic and rubber price crisis : oil palm appears as the main alternative but rubber is not substituted or abandonned. Sometimes not tapped?
-
- 2007 : rubper price at a peak :WINDFALL EFFECT !

- roundup very cheap : no need for low cost agroforestry practices based systems
- Adoption of round-up based weeding rubber monoculture system
- Further enrichment with econommically interesting trees (Gaharu) after opening
- Oil palm is not anymore a priority (land scarcity)
- Jungle rubber are almost not tapped

- PRIORITY to livelihood improvement (housing, moto, schooling..)
- Intensive use of credit (Kredit Union)

Disbun demo plot : 250 rubber trees/ha with Gaharu : farmers not interested BUT AFS are recognized

RAS plot with AF practices

- Sodianto' plot in Trimulia , transmigration with fruit trees : fruit trees do produce but no market except for durian

RAS 2 plot (13 years old) vs monoculture young plantation with further enrichment

- Suwito's plot
- In trimulia

Andrea's plot in Engkayu : successfukl RAS 2 . Fruit trees do produce but not every year !! No market for rambutan , local market for jengkol and petai : mainly for self consumption

Angkong'plot in Engkayu

Gabriel’ plot : EAS 2 with clone comparison with poor management

Hypothesis for RAS

- No markets for fruit in Kalimantan (far different in Thailand except Durian.
- Local Durian requires 10 to 15 years of immature period
- Not yet well developped timber market but good potential and timber marketing by farmers is allowed now !
- Good potential for Gaharu with disbun support (8 years cycle)

RAS 1 and 3 (Indi)

Sidon's plot

Alosyus's plot

Indi's plot

Clonal planting
Material production

Sawah in
Trans migration
area

Housing improvment and motorbikes

RAS adopted if :

- For immature period : suitable contexts

- Low cost is required (poor or isolated farmers)
- Remote plots with limited access or time allocated.

For mature period :

- Associated trees with short cycle (Gaharu) with existing markets (tengkawang, Durian...

- Rubber price triggers cropping pattern adoption

To be valorized

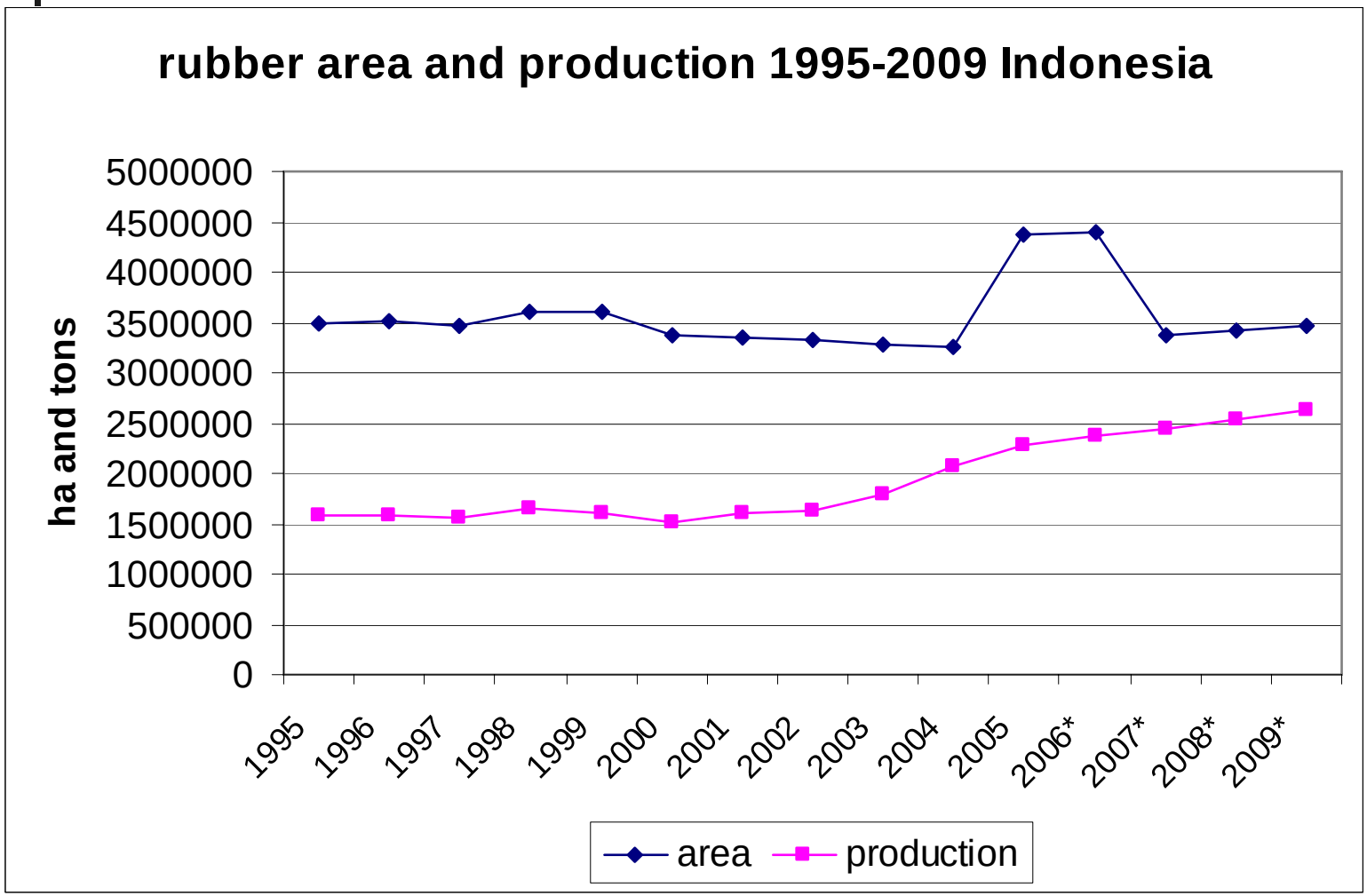
- The « sanjan model »
- = the initial model on which RAS 2 has been set up.
- We have data on associated trees in 1997 and in 2006 for 15 plots
- Base for tree enrichment

Still some themes to be developped

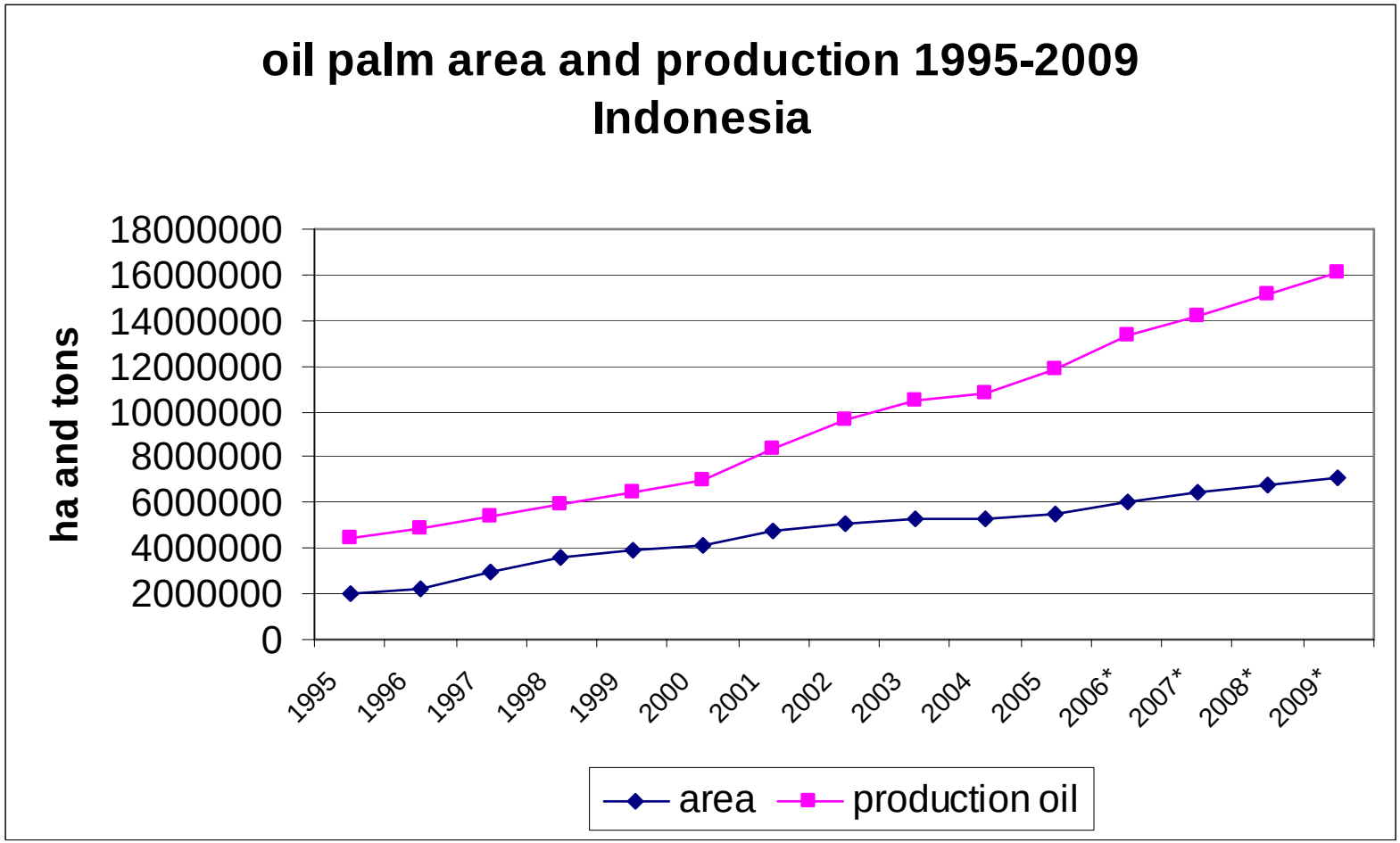
- Real impact
- on production
- in the long term
- of Phytophtora

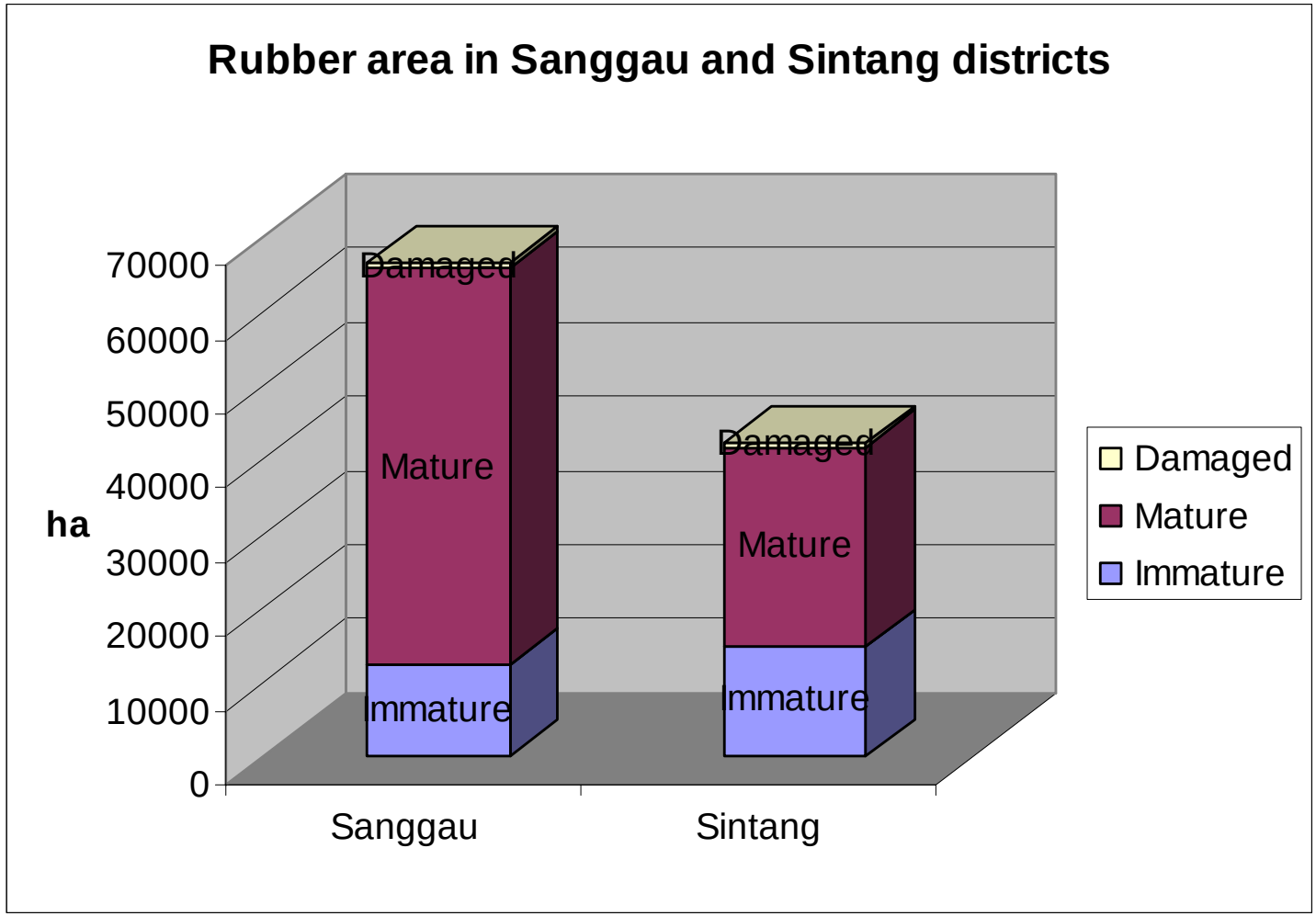
Impact of poor tapping, excessive bark consumption or high tapping frequency (Trimulia) on rubber production in the mid run.

Production and rubber area skyrocket since 2003



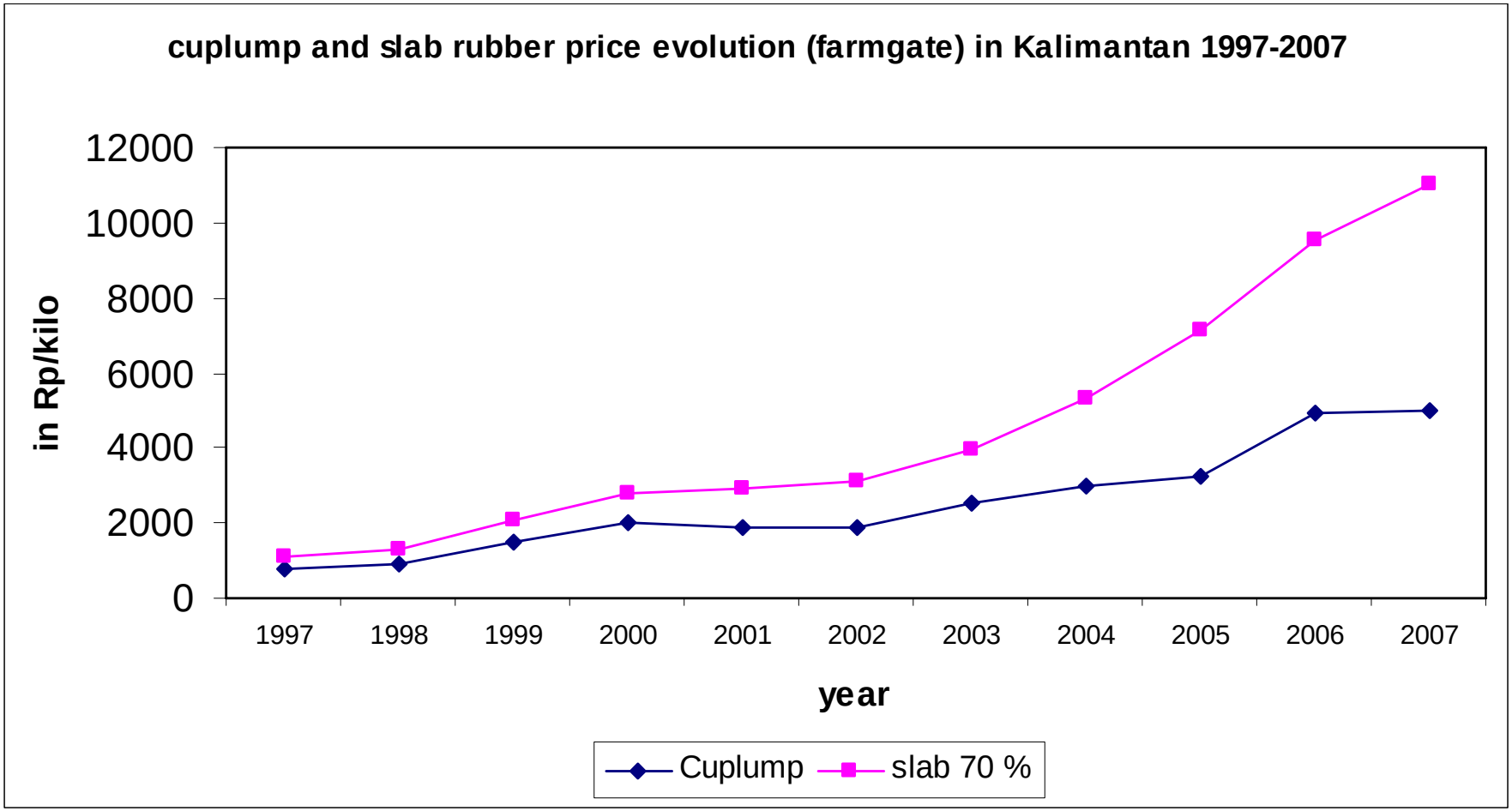
Oil palm : area x 3 & production x 4




Rubber area in Sanggau and Sintang districts
ha
70000
60000
50000
40000
30000
20000
10000
0
Damaged
Mature
Immature
Damaged
Mature
Immature
Sanggau
Sintang
Damaged
Mature
Immature

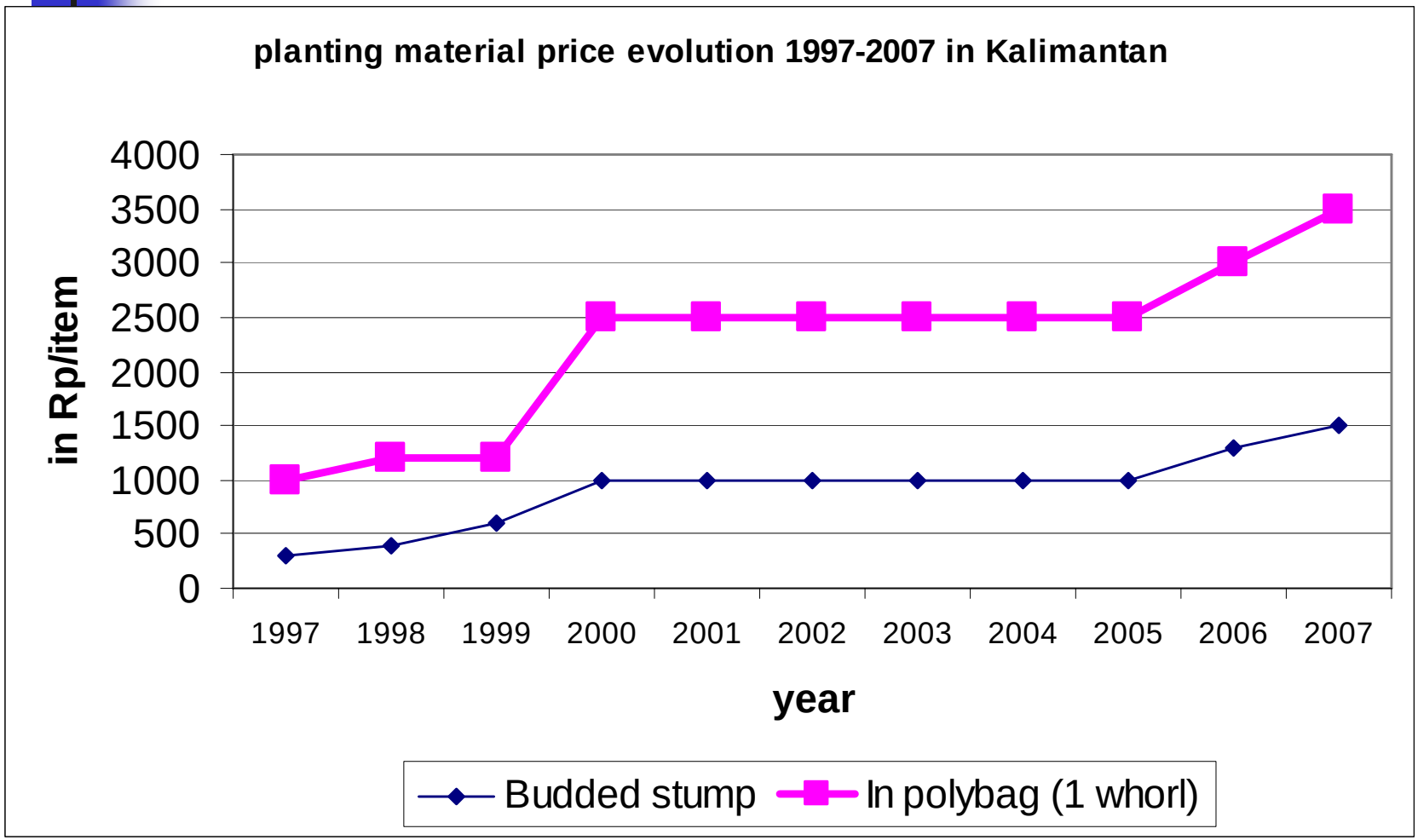
The rubber windfall since 2005

Note : the rupiah is stable since 2003 at around 9 000 /US $

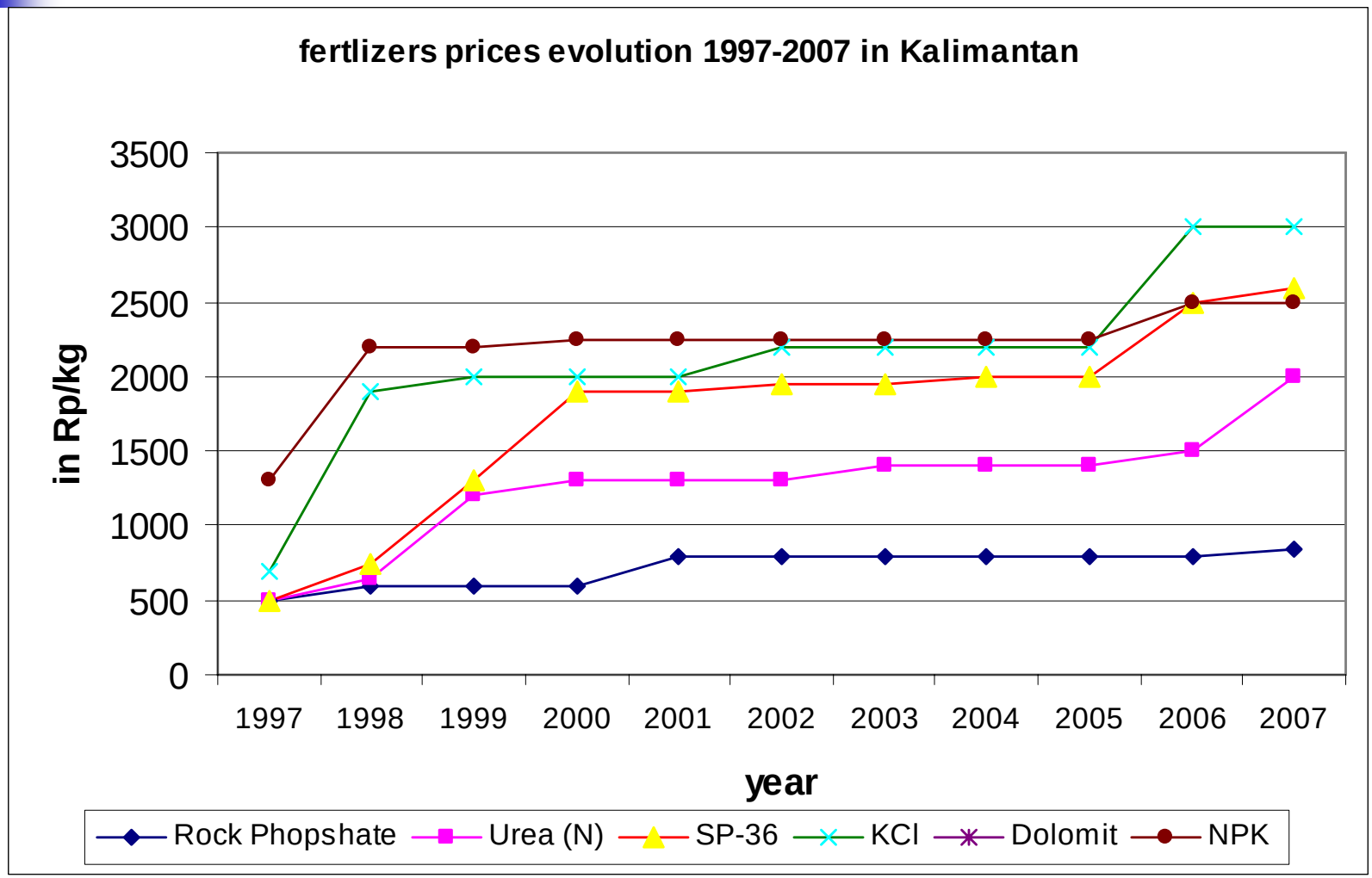


Clonal Rubber planting material has been stable for 2000-2005.

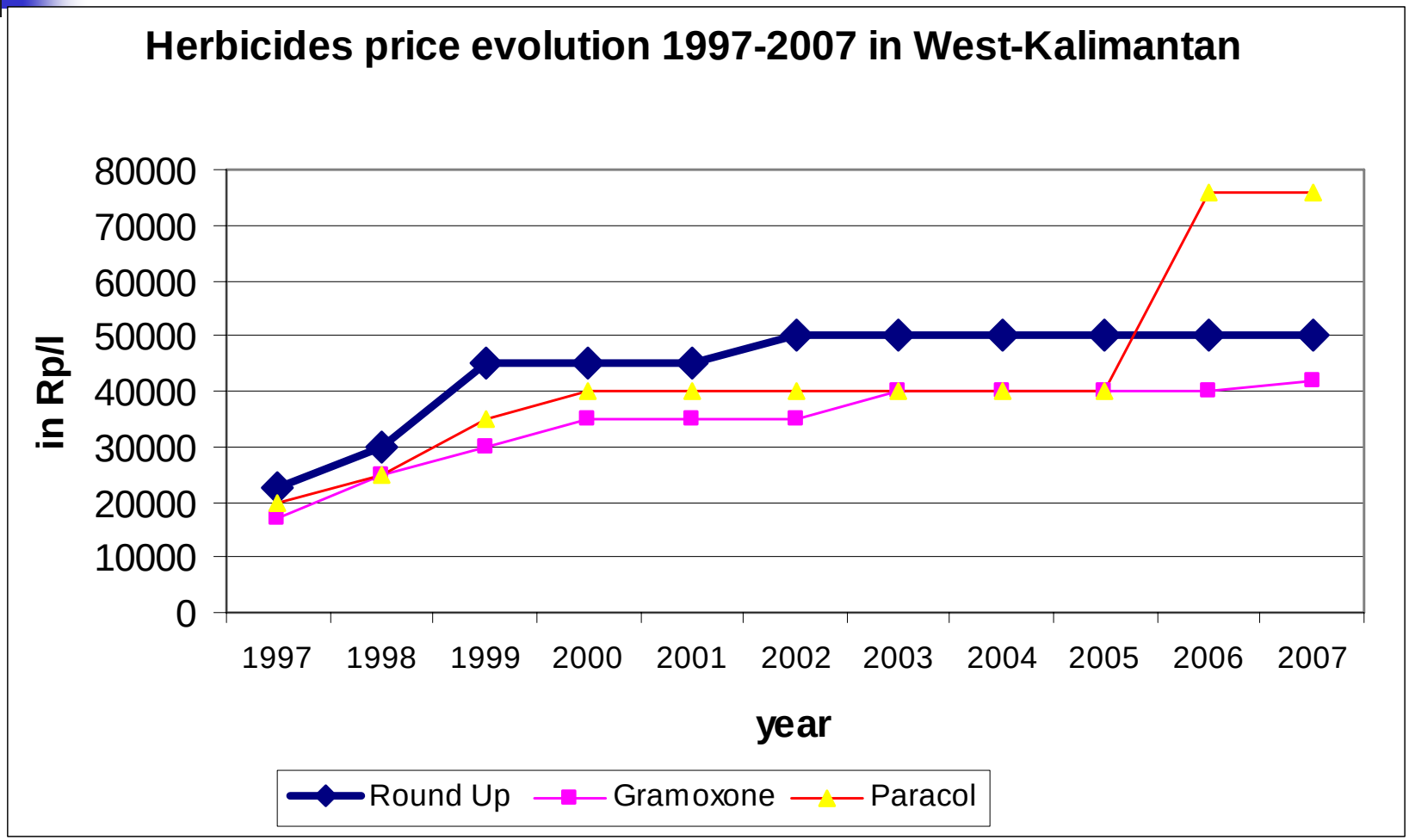
High demand since 2006



A 20 % increase of fertilizers price since 2006 : no impact on rubber but on oil palm



Round-up price stable since 2000



The « round-up effect » paved the way for monoculture

- 1 liter of Round –up equivalent to :
- - 15 kg of rubber in 1997
- - 3,5 kg of rubber in 2007
- More efficient than manual labour
- 2 applications/year at 3 liters with 4 days of work the first year
- Capital required is limited : 300 000 Rp
- Gotong Royong (traditionnal group of labour) has diseappeard.
- Upah (local temporary external labour) is rare (22 000 Rp/day.)

Rice planting decreases

- In average 0,25 ha of sawah in transmigration area, no ladang.
- 0,5 hectare of ladang for dayak farmers.
- Tend to disappear.

Wide use of credit

- Recent use since 2005
- Large amount as soon as rubber price increased in 2006
- 10 to 20 millions per farmer reimbursed in 3 years at 2 %/month rate
- Mainly for housing improvment , motobikes and schooling.
- New planting expenses covered by oil plam and rubber incomes

- Risks if rubber prices decrease to 1 US $/kilo.

The « oil palm dream » is over

- The promise of 1 million Rp /month/kapling of 2 ha is OK
- BUT
- Meantime rubber provides 1,2 million Rp per ha
- Rubber income is 2 x that of oil palm without loosing 5.5 ha of land per kapling

In Trimulia

- Transmig farmers have still not yet received their land certificate
- The 0.75 ha oil palm plot has still not be transfered to farmers 8-10 years after planting !
- - farmers received a 100 000 RP allocation/plot with no labour.
- = big problerm for farmers with limited land !

- Sawah remains an interesting cropping alternatives.
- Farmers do buy surrounding land to plant rubber.
- Half or new rubber planting are not clonal !!!

Conclusion

- Adapt rubber systems to the type of farmers and its context/Economical environment :
- Recommendations linked with a typology of situations

- RAS 1 still interesting for poor or remote farmers
- Market oriented associated timber of fruit trees for wealthy farmers (RAS 2)

- RAS 3 difficult to establish due to lack of available planting material for covercrops and associated Fast Growing Trees (FGT) and low cost of Round up.

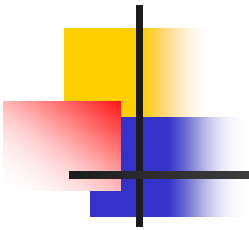
Farming system modelling

- Olympe files for Jambi and Kalimantan have been reviewed and are currently corrected=
- Operationnal Reference farming system modelling tool (2 files with Wulan : Kalimantan and Jambi).
- Integration of real production observed in SRAS plots : has still to be done for real farmers.

- Produce synthetic table with main reults per cropping systems (total labour requiments , margin and return to labour)

- Scenarios to be studied according to rubber prices : risks of the present credit ……impact of currrent replanting in the next 10 years.

- Laure's file (2005) used to test scenarios in Kalimantan with « representative farmers ».
- Aude 's file available for Thailand



- Some Olympe results .....

Cropping system comparison on margin/ha and return to labour : a synthetic table to be done.

results Kopar — MARGIN/HA & RETURN TO LABOUR COMPARISON BETWEEN SYS

JUNGLE RUBBER

	Average	Before_1	1	2 et +	5 et +	10 et +	15 et +	30 et +
Products	560						1 000	750
Expenses	17						25	25
Expenses Vol	0							
Margin	533						975	725
Total Margin							14 625	18 250

CLONAL MON OCULTURE SENDIRI — PB 260

	Average	Before_1	1	2 et +	4 et +	8 et +	10 et +	22 et +
Products	1 451					1 700	2 600	2 000
Expenses	267		1 465	795	100	225	325	225
Expenses Vol	0							
Margin	1 185		-1 465	-795	-100	1 475	2 275	1 775
Total Margin			-1 465	-3 055	-3 255	2 645	29 945	37 045

RAS STANDART — SAME

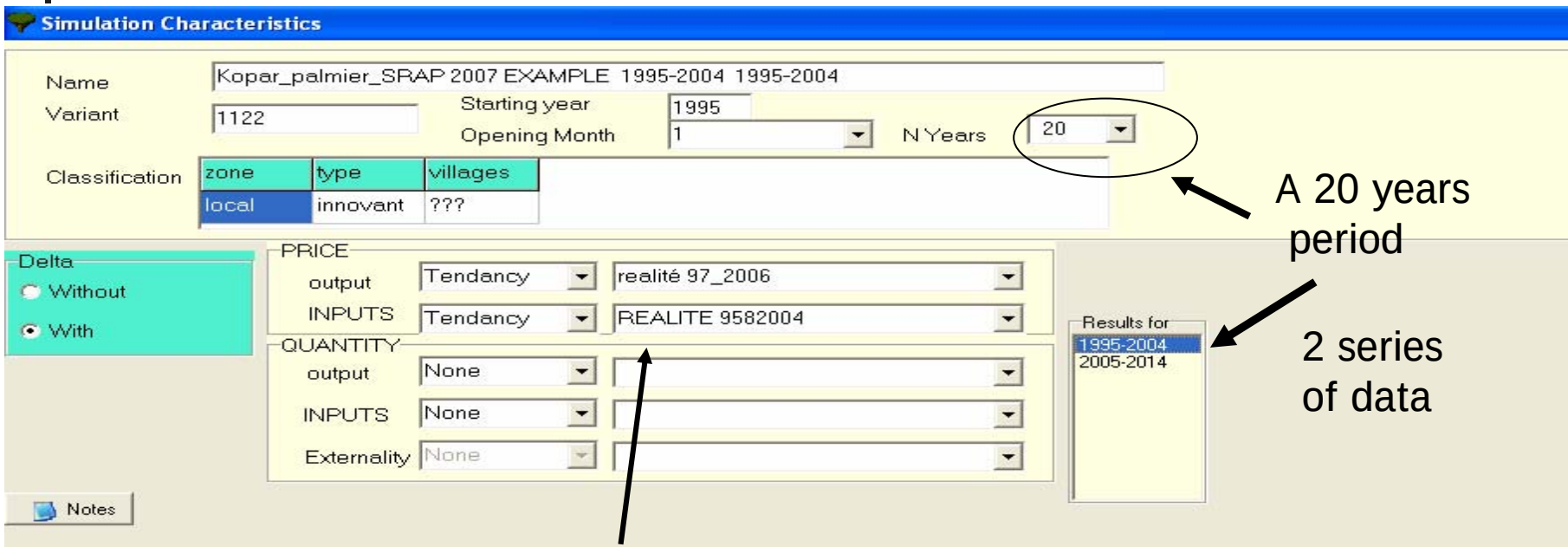
	Average	Before_1	1	2 et +	4 et +	8 et +	10 et +	22 et +
Products	1 451					1 700	2 600	2 000
Expenses	267		1 465	795	100	225	325	225
Expenses Vol	0							
Margin	1 185		-1 465	-795	-100	1 475	2 275	1 775
Total Margin			-1 465	-3 055	-3 255	2 645	29 945	37 045

For rice

	LADANG	PAYA
Products	750	1 800
Expenses	400	400
Expenses Volume		
Margin	350	1 400
Margin/hour	0.44	1.92

Farming system analysis on 20 years :how to do it !!!

1995-2004 and 2005-2014

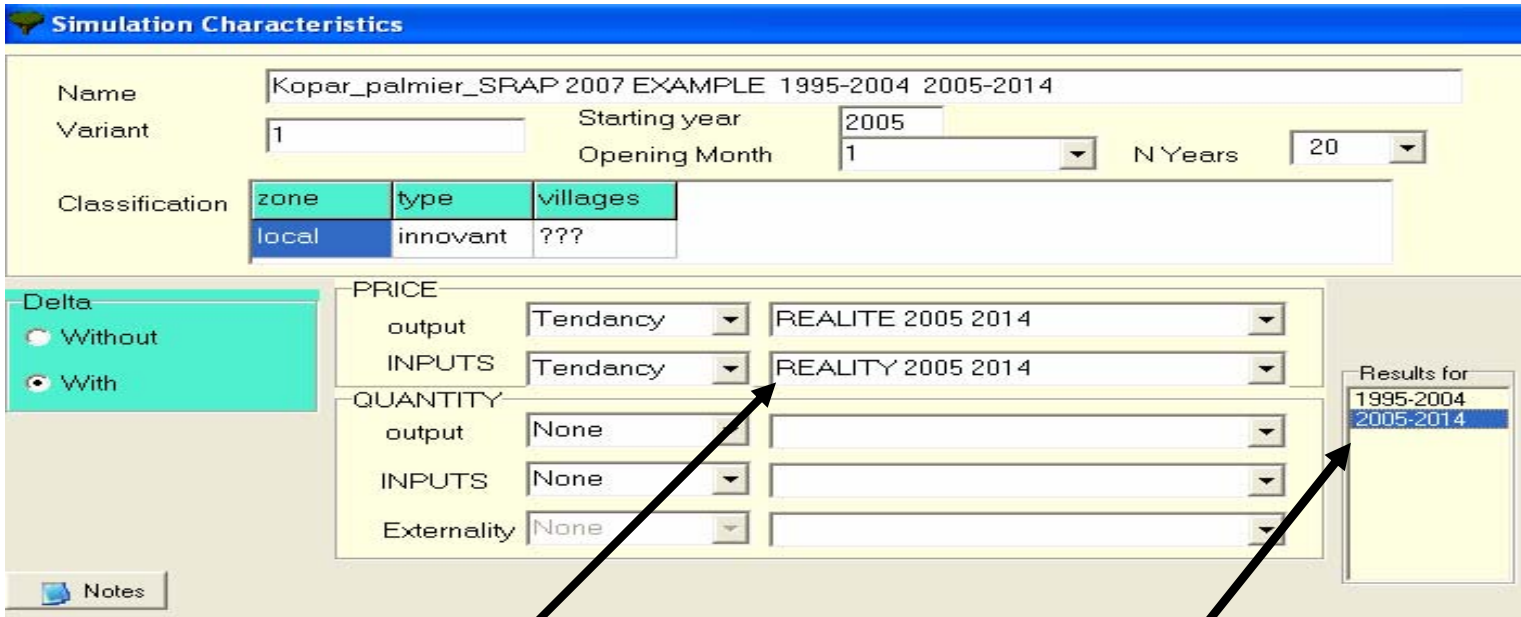


A 20 years period

2 series of data

2 sets of delta for real prices
- Products prices
- Inputs prices

2005-2014

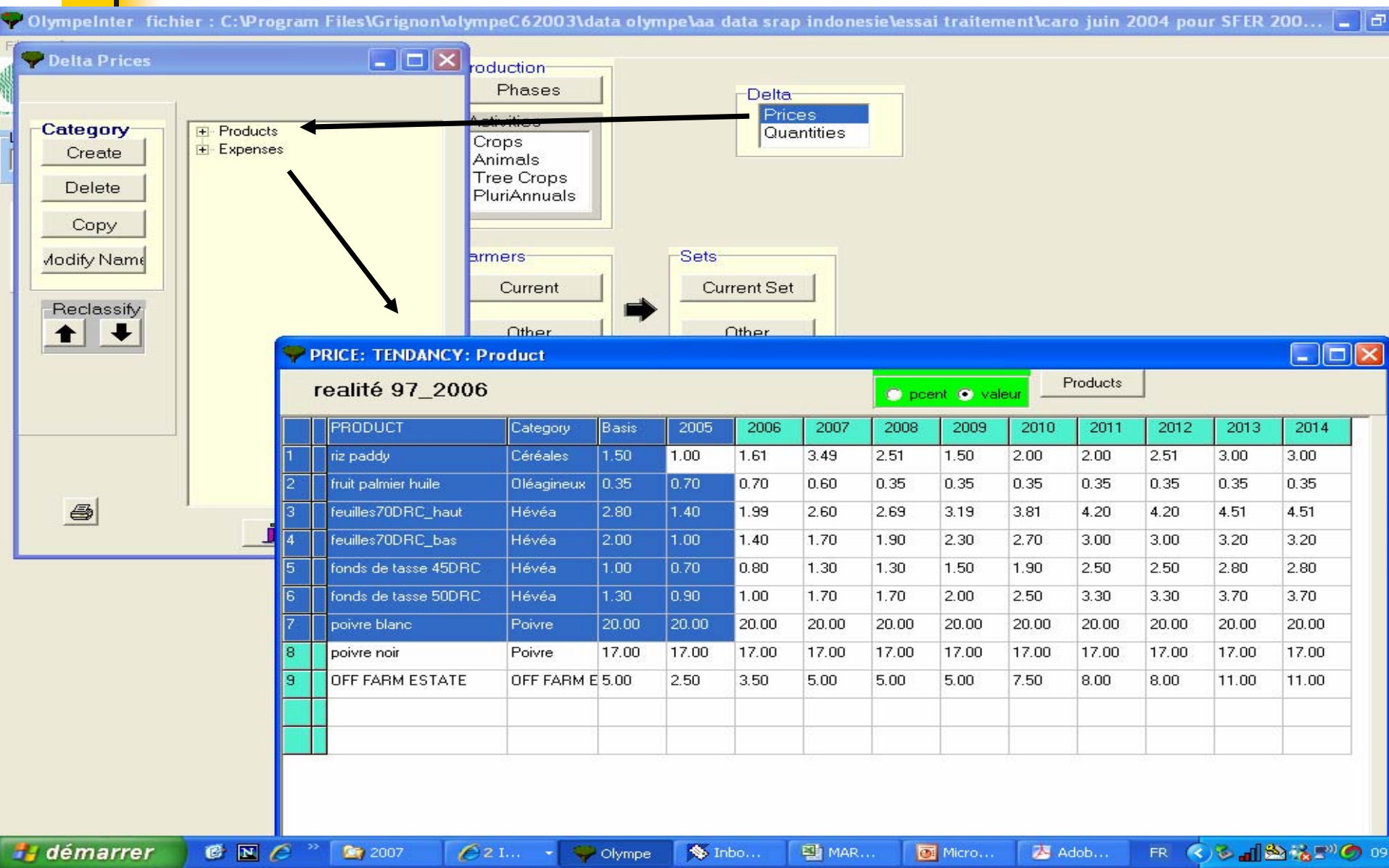


Relevant series of delta with real price

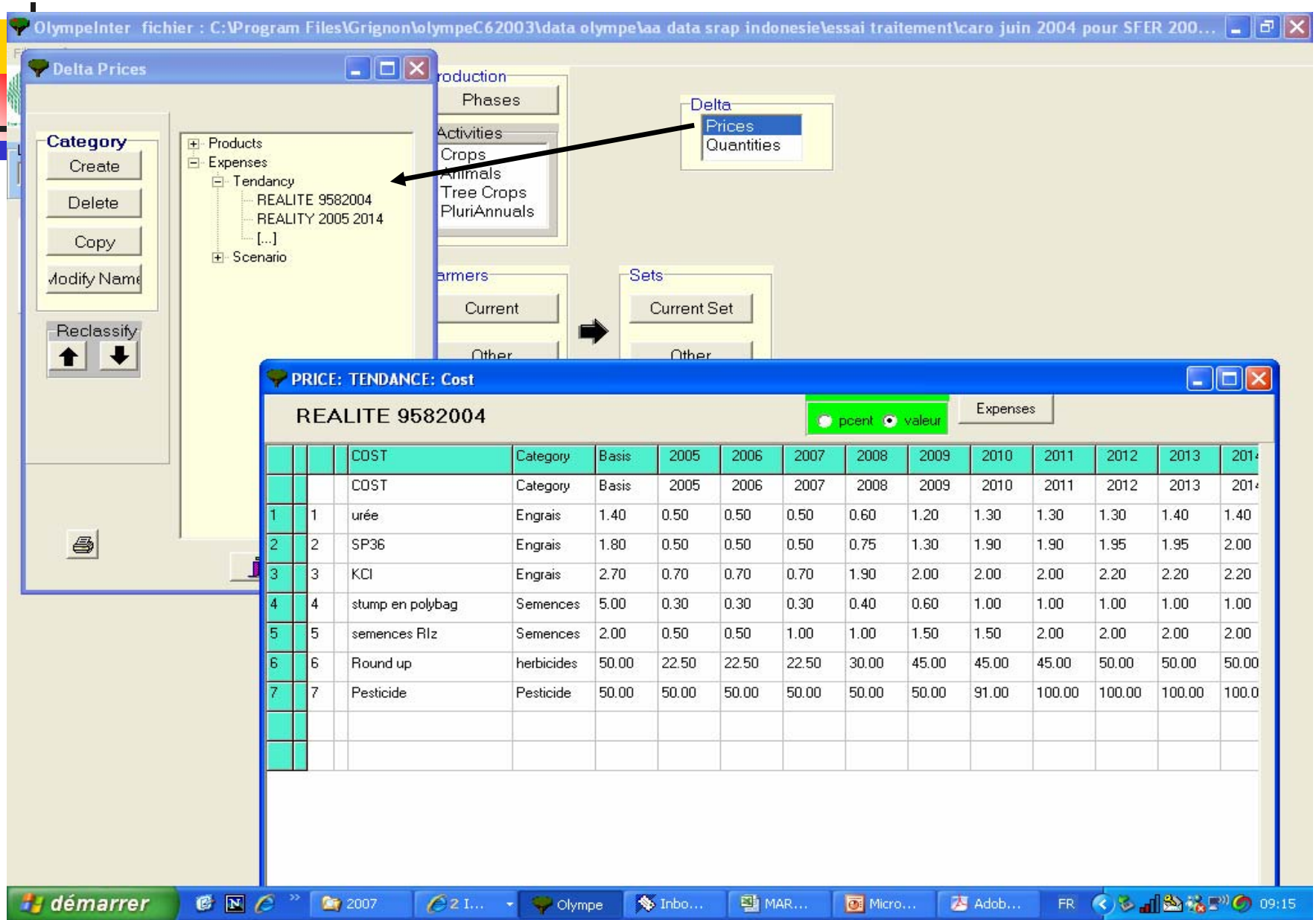
Second cycle

After 2007 : prospective analysis and scenarios building up

Set up a « Delta » for real price analysis



Same with expenses/inputs

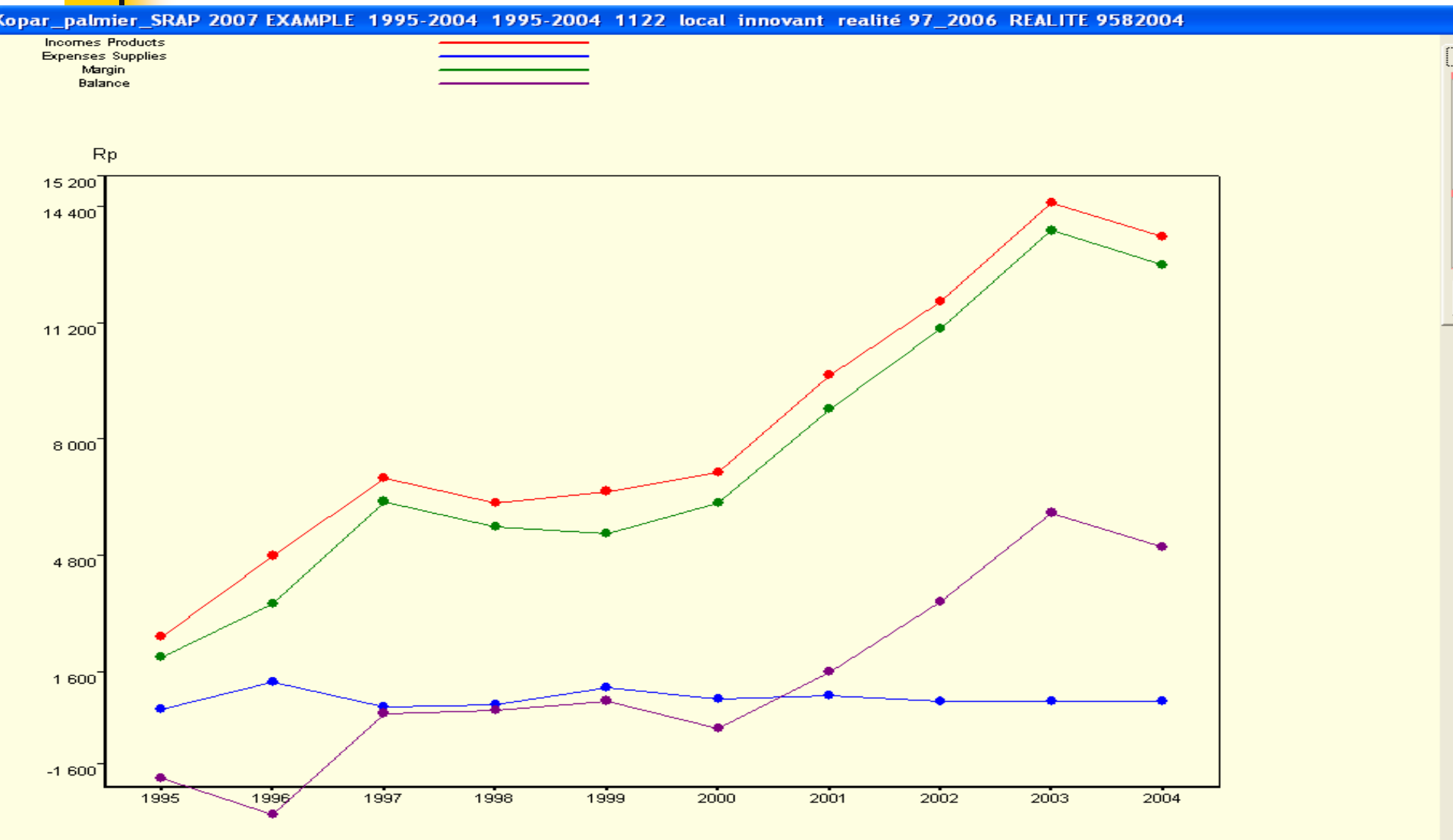


			COST	Category	Basis	2005	2006	2007	2008	2009	2010	2011	2012	2013	201
			COST	Category	Basis	2005	2006	2007	2008	2009	2010	2011	2012	2013	201
1		1	urée	Engrais	1.40	0.50	0.50	0.50	0.60	1.20	1.30	1.30	1.30	1.40	1.40
2		2	SP36	Engrais	1.80	0.50	0.50	0.50	0.75	1.30	1.90	1.90	1.95	1.95	2.00
3		3	KCl	Engrais	2.70	0.70	0.70	0.70	1.90	2.00	2.00	2.00	2.20	2.20	2.20
4		4	stump en polybag	Semences	5.00	0.30	0.30	0.30	0.40	0.60	1.00	1.00	1.00	1.00	1.00
5		5	semences RIz	Semences	2.00	0.50	0.50	1.00	1.00	1.50	1.50	2.00	2.00	2.00	2.00
6		6	Round up	herbicides	50.00	22.50	22.50	22.50	30.00	45.00	45.00	45.00	50.00	50.00	50.00
7		7	Pesticide	Pesticide	50.00	50.00	50.00	50.00	50.00	50.00	91.00	100.00	100.00	100.00	100.0

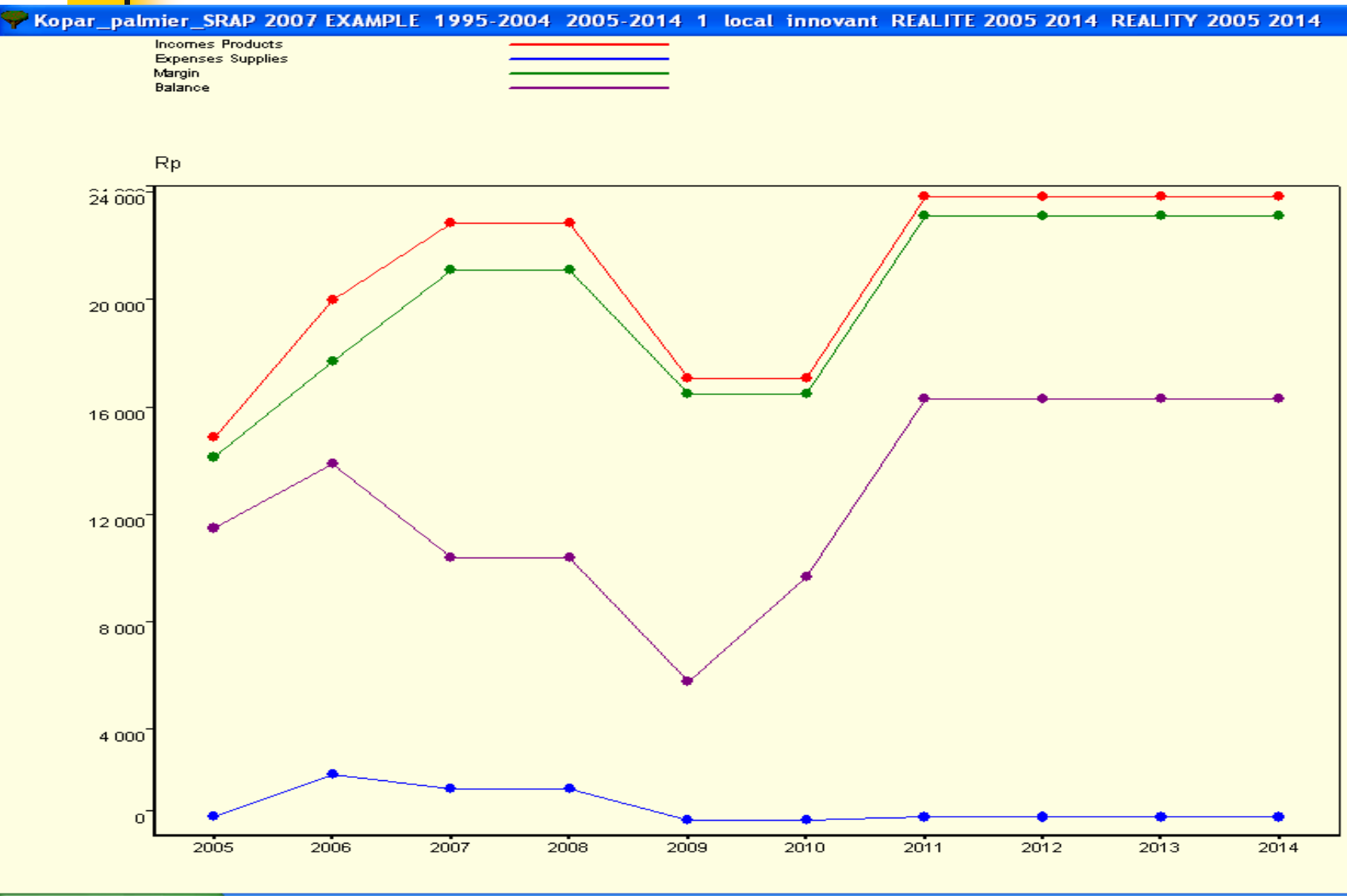
- Same for
- - 1995-2004
- - 2005-2014
- Export to Excell for table and nice graph on a 20 years period

- An example with a representative farm from Kopar in West Kalimantan

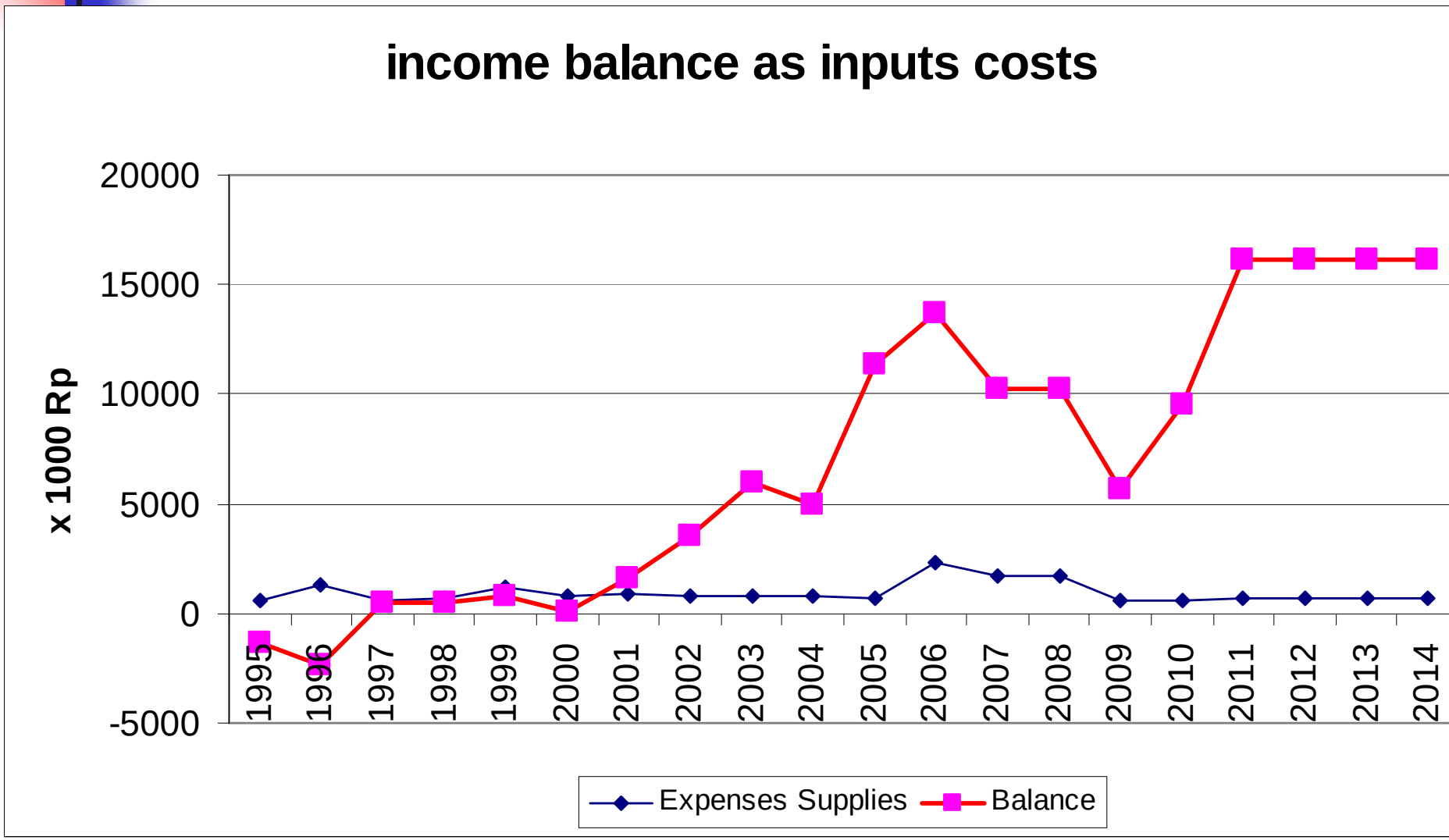
Income from 1995-2004



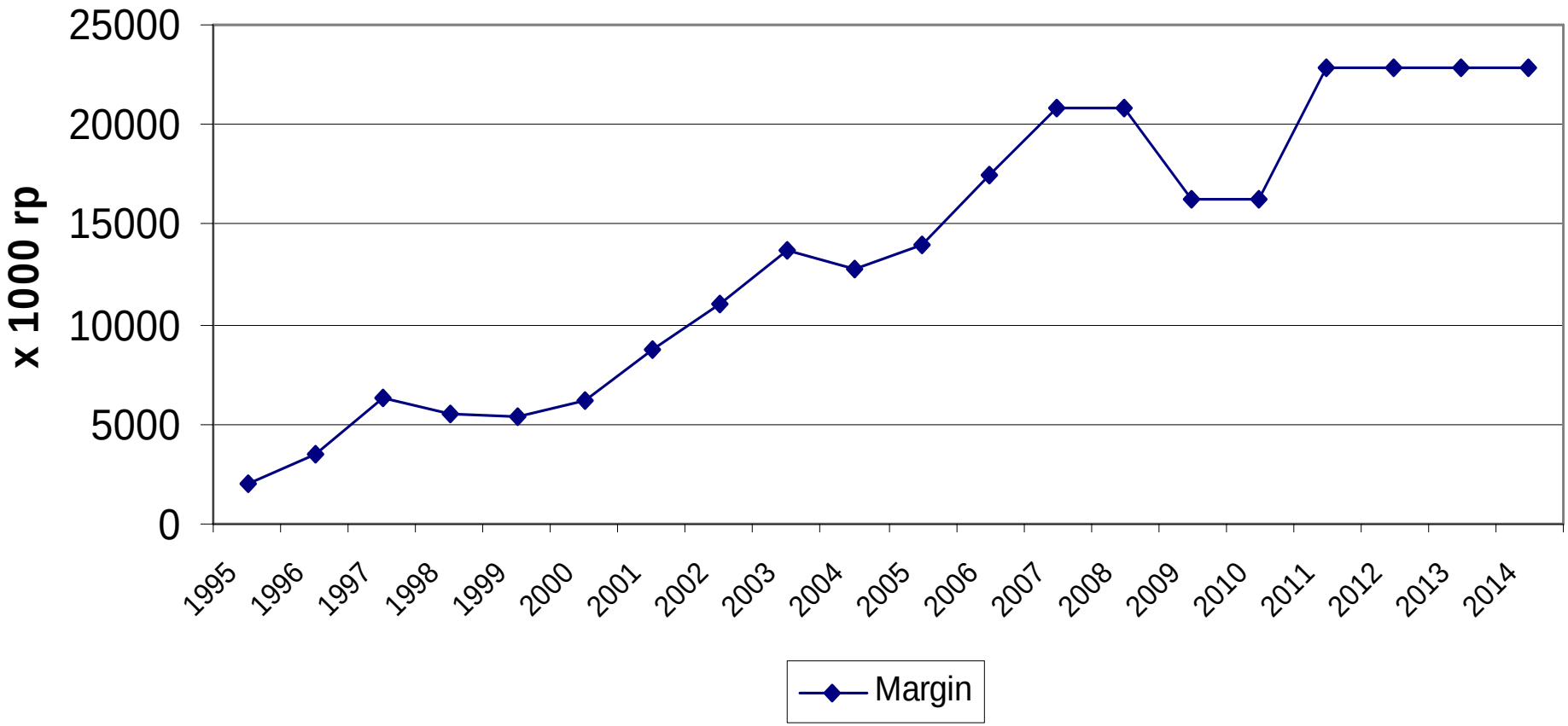
Income evolution 2005-2014



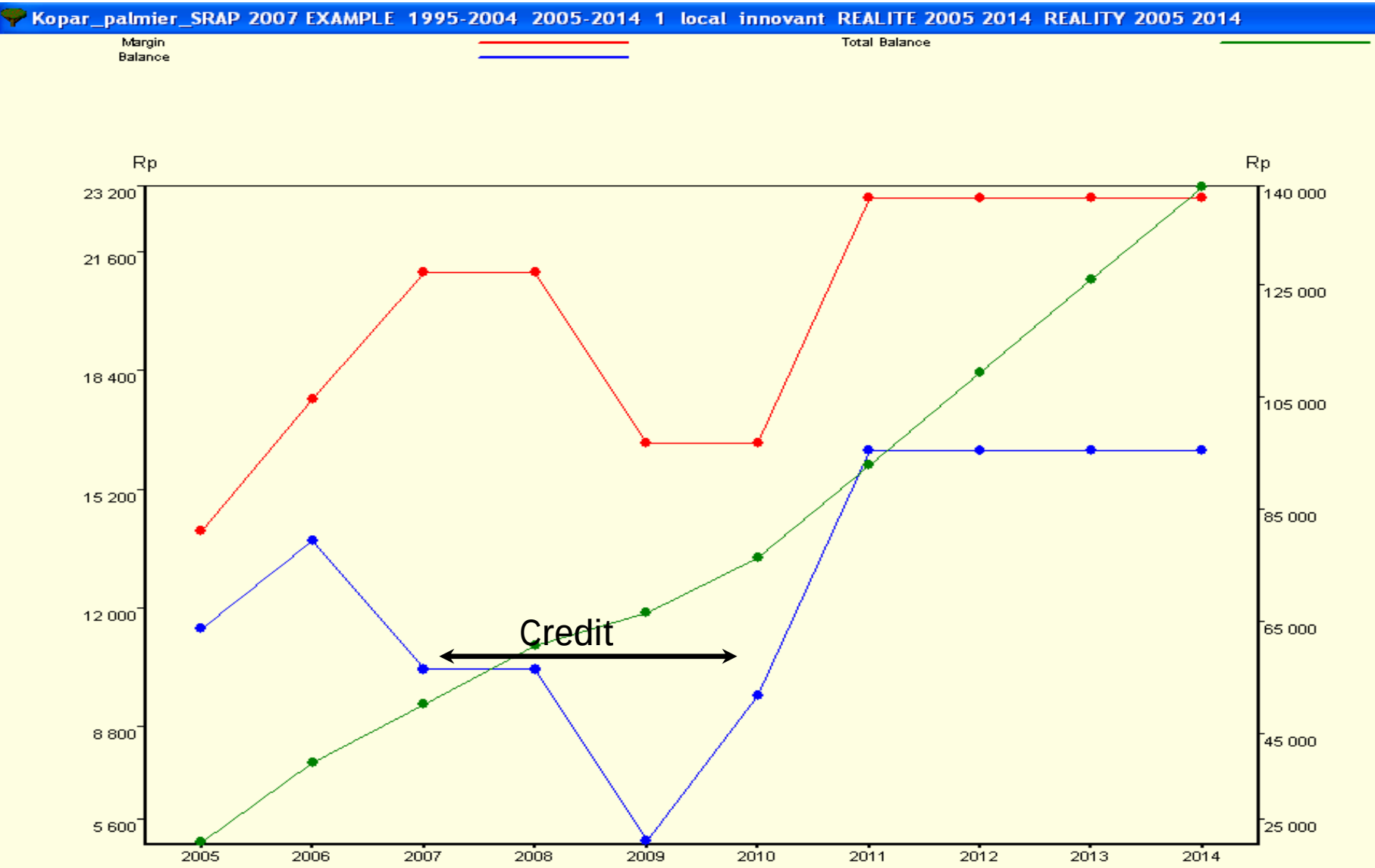
Analysis of balance (net income after family expenses) and inputs costs.....



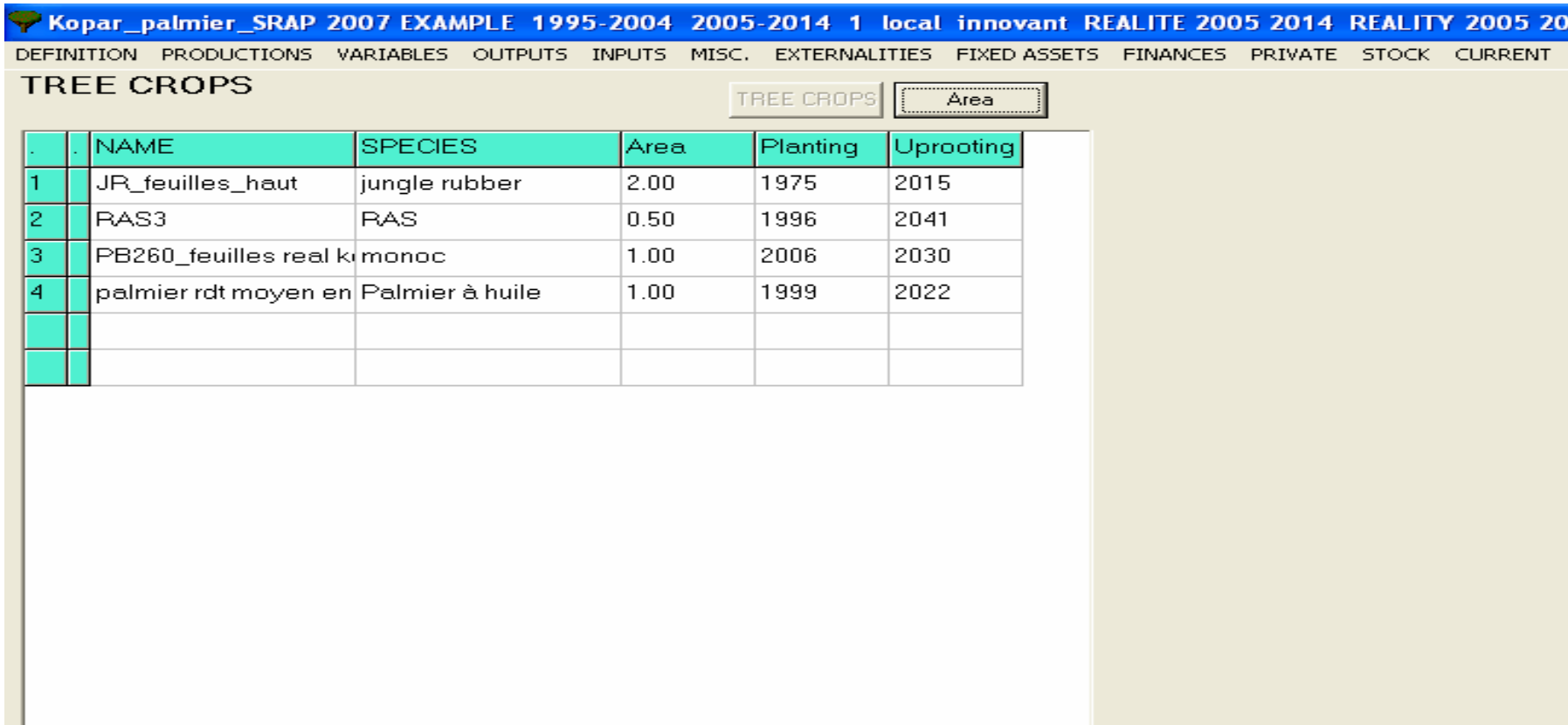
Farm gross margin (agricultural income) evolution



Gross margin (agricultural income), **balance** (net income after family expenses) & **cumulated balance** (accumulation of capital)



Foodcrops and treecrops distribution



.	.	NAME	SPECIES	Area	Planting	Uprooting
1		JR_feuilles_haut	jungle rubber	2.00	1975	2015
2		RAS3	RAS	0.50	1996	2041
3		PB260_feuilles real k	monoc	1.00	2006	2030
4		palmier rdt moyen en	Palmier à huile	1.00	1999	2022

Data analysis to be done

- Synthetic table on labour requirements, gross margin/ha and return to labour for each cropping system

- Income analysis and evolution
- Use of « delta » to apply real prices
- Export data on Excell and join the 2 series of 10 years
- OK for 1995-2004 and 2005-2014
- Then prospective analysis for 2007-2014

Further prospective analysis : some hypothesis :

- - impact of rubber price evolution (sensibility analysis)
- - risks with current credit to be reimbursed if.....
- capital acculumation and investment in new plantation ;.....
  - Knowing the current behavior in priority to increase livelihood (quality of life)

Thank you for your attention !!!

ATTENTION
Thinking
Rubber researcher
in progress !!!

Project close out
SOON !!!!!

BUT STILL SOME PAPERS TO DO !!!